

# SCIENCE DIGEST

## CALIFORNIA'S COMING EARTHQUAKE

**PREVIEW  
OF DISNEY'S  
WORLD'S FAIR  
SHOWS**

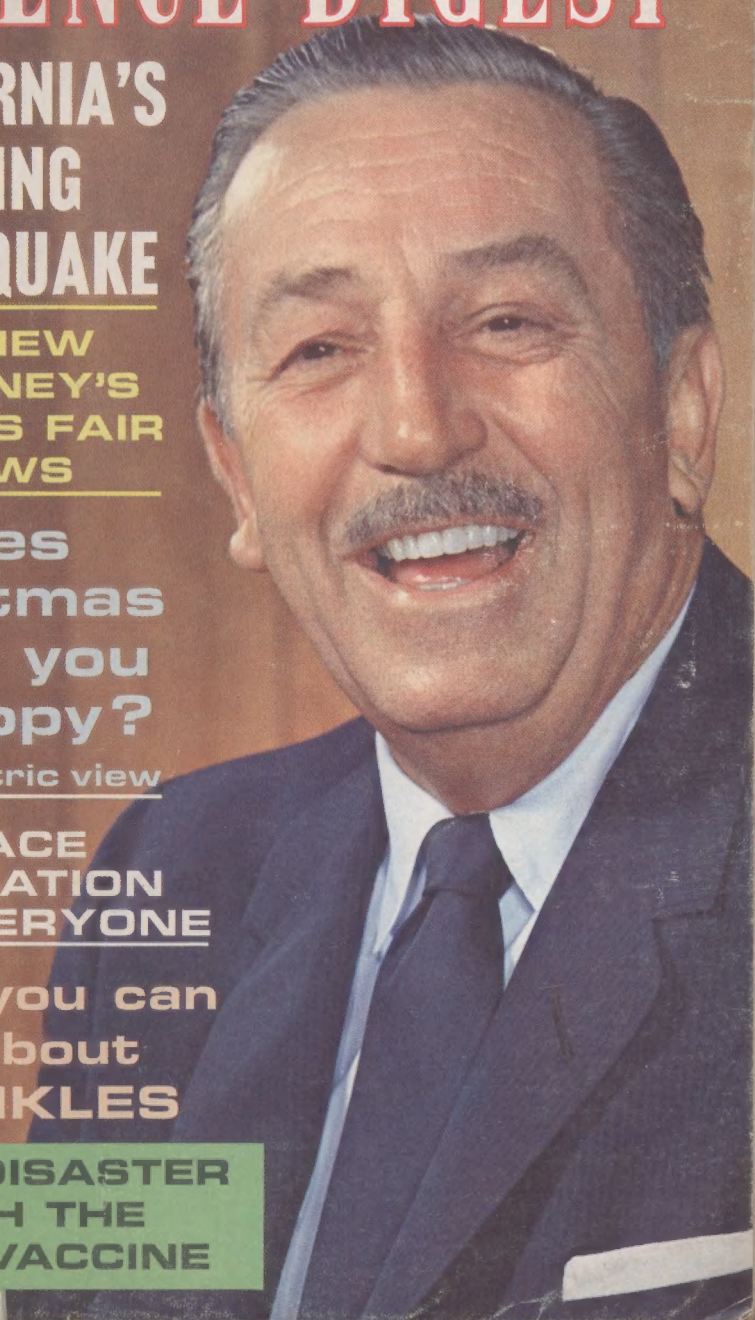
**Does  
Christmas  
make you  
unhappy?**

**A psychiatric view**

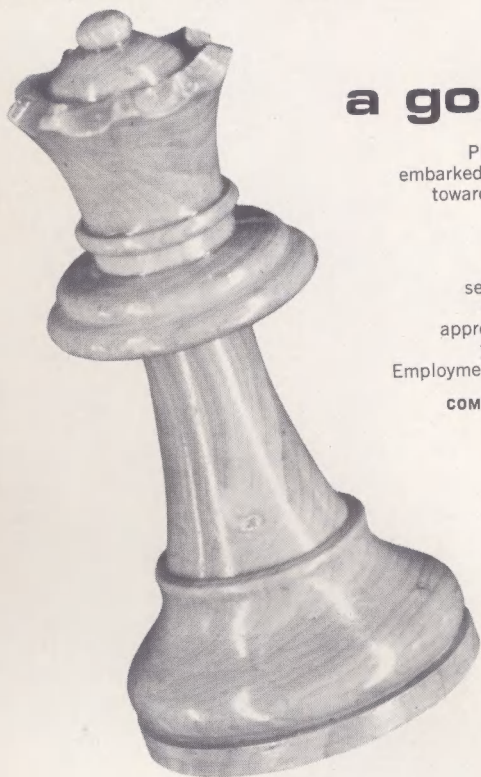
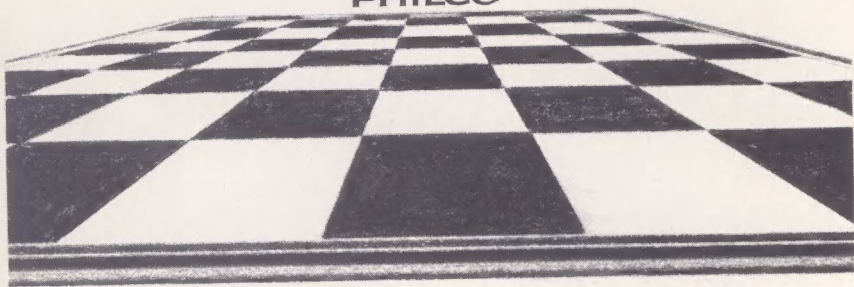
**SPACE  
NAVIGATION  
FOR EVERYONE**

**What you can  
do about  
WRINKLES**

**NEAR DISASTER  
WITH THE  
SALK VACCINE**



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# SCIENCE DIGEST

Twenty-seventh year of publication

Walt Disney, a latter-day Santa Claus with a scientific bent, is preparing four shows for the 1964 New York World's Fair. For an exclusive preview of what you'll see and do at these displays, see page 8.



DECEMBER • 1963

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TO  
**LETTERS**  
SCIENCE DIGEST

## Rockets in our feet

The letter by F. J. Oehm (Sept. '63) is slightly bewildering. (*Oehm questioned the value and wisdom of putting a man on the moon—Ed.*) He refuses to see what a lunar landing would do, other than satisfy our curiosity. Our curiosity? Shades of Columbus and Eric the Red. What a waste!

He also asks if it is possible that we are meant to stay on earth. Well, I suppose we were. If we were meant to go into space, we would have rockets in our feet and our blood would be liquid oxygen and alcohol.

And we weren't meant to fly because we haven't got wings.

AL NOMIS  
Egbertsville, N.Y.

## Best of life

"Key to Health—Your Heredity" by Dr. Roger Williams (April '63) is, in my opinion, one of the best articles dealing with the total aspects of life



science. My 40 years in the field of education lead me to say that the article should be in the hands of all educators.

ARTHUR E. MORR  
Auburn, Ind.

### Pro UFO

May I inform you that nothing has happened to flying saucers; they are still with us. I saw some myself last December! ("What Ever Happened to Flying Saucers?" Sept. '63.)

BENNIE E. WALTERS  
Seattle, Washington

Please keep in mind that our government has withheld information before in the so-called interest of public "safety."

GARY HINKLEY  
San Diego, Calif.

I presume that Menzel has considered the fact that some of the most reliable UFO (unidentified flying objects) reports have been made by commercial and military pilots. If these pilots, who are entrusted with the lives of millions of Americans, can't tell a balloon from a UFO they should not be permitted to fly. It is interesting to note that not one pilot has been grounded for reporting a UFO.

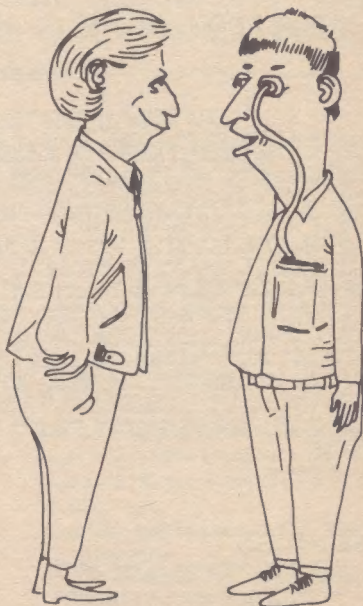
DENNIS EDGINGTON  
Bladensburg, Md.

You might call me one of those "die-hard saucerites" you mentioned in your favorable review of Menzel and Boyd's book "The World of Flying Saucers."

To anyone who has delved into the UFOs for some time, it is plainly visible that about 75 percent of all the

so-called "UFOs" are misinterpretations of natural phenomena. But about 25 percent of all sightings are not so easy to explain. Also authenticated photographs of UFOs have been taken. For example, in 1958 the Brazilian Navy spotted a UFO. A civilian photographer took four photos of it. These photos were reported as a "positive proof" both by the Brazilian Navy and the Brazilian Congress.

The Air Force seems to be pretty concerned over the UFOs. Besides having several official regulations on UFOs, the Government has spent 52 million dollars investigating UFOs. Why waste taxpayers' money on balloons, birds, etc.?



WOLTZ

"Pocket TV."

Although a lot of opportunists have invaded the field, there are still a few serious research groups, which are trying to get the other side of the story across. Anyone who is interested in scientific UFO research, or wants the real facts on UFOs should contact the National Investigations Committee on Aerial Phenomena (NICAP), 1536 Connecticut Ave., N.W., Washington 6, D.C.

DALE RETTIG

Chairman, Ill. Aerial Phenomena Agency  
Glenview, Ill.

UFO reports and their evaluation, like any other empirical matter, should be a matter of scientific investigation. It is highly questionable whether UFOs have been scientifically investigated, either by the Air

Force or Menzel. Both use what I have called the Deluded Observer Hypothesis—the *a priori* assumption that nothing unique is being seen—and on this basis proceed to try to pinpoint the conventional object or phenomenon which has deluded the observer. By this method it is not difficult to find some phenomenon which could have caused the sighting, but seldom has either Menzel or the Air Force been able to pinpoint a definite occurrence which did explain the sighting.

The Deluded Observer Hypothesis begs the question of whether the UFOs are something real and unique which cannot be forced to fit a conventional mold.

RICHARD HALL  
Secretary of NICAP  
Washington, D.C.

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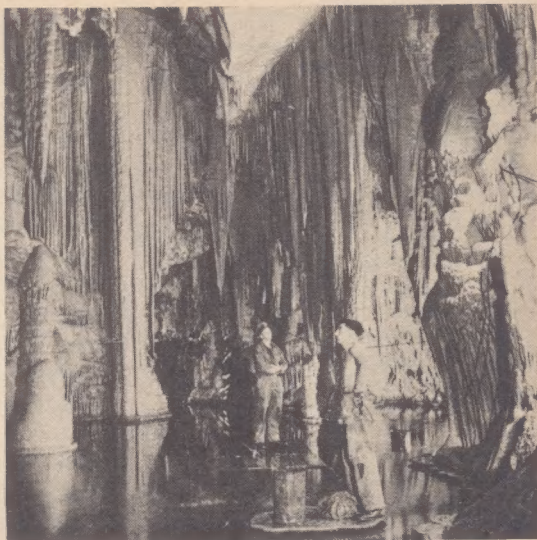
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I certify that the statements made by me above are correct and complete.

HUBERT PRYOR, Editor





K.F.S.


## Are you a cave man?

by John and Molly Daugherty

A hundred years ago, geologists knew of only 50 caves in the United States. Today they know of more than 5,000. Knowledge of caves is increasing all the time. How much do you know?

1. Which speleothems (cave formations) seem to defy the law of gravity?  
☒ a. Stalactites  
b. Stalagmites  
c. Helictites
2. Most of the world's important caves are found in:  
a. Sandstone  
☒ b. Limestone  
c. Shale
3. You may be in danger if you build a fire in a cave because you might:  
☒ a. Be overcome by carbon monoxide  
b. Start a fire in a coal seam  
c. Cause the roof to fall in
4. Where is the world's highest known ice cave?  
a. Spain  
b. Switzerland  
☒ c. U.S.A. (Colorado)
5. The first sightless cave animals discovered, blind fish—found in Echo River, Mammoth Cave, Kentucky—are blind because:  
a. The species never had any eye structure  
☒ b. Their ancestors lost their eyes through disuse  
c. Minerals in the waters of the cave have destroyed the eyesight of these fish

6. A good caver doesn't disturb bats he finds hibernating in caves because they may:

a. Get in his hair  
 b. Bite him  
 c. Die if awakened

7. If you should discover a new cave, your first step should be to:

a. Smoke the letters N.S.S. (National Speleological Society, an organization of amateur cavers) near the entrance  
 b. Smoke your own initials and date of entry near the entrance  
 c. File a claim at the nearest U. S. Post Office

8. Where is there a "sea cave" in a desert in the United States?

a. Arizona  
 b. Utah  
 c. Southern California

9. If you should find bones or Indian relics in a cave floor, you'd be well-advised to:

a. Leave them where they are  
 b. Dig them out and save them for the Natural History Museum  
 c. Send them registered mail to the Department of the Interior in Washington, D.C.

10. A "dead" cave is one in which:

a. Stalactites and stalagmites glisten  
 b. Water seeps or drips from the walls and ceilings  
 c. Rimstone is soft and flaky

## Answers:

1—c Helictites are grotesque stony formations that curl and twist in various contortions. The growth of the crystal changes direction frequently during its progress.

Stalactites grow from the ceilings of caves. Stalagmites grow from the floor.

2—b Limestone is composed of the mineral calcite, a carbonate of calcium. The natural waters of the earth may contain carbon dioxide. The action of the weak acid, carbonic acid, formed when carbon dioxide is present in water, changes the calcium carbonate to calcium bicarbonate, which is very soluble. Through this process the limestone is eaten away over a long period of time and a cave is produced.

Shale and sandstone are not dissolved by carbonic acid.

3—a Fire uses up a considerable supply of oxygen. In close quarters, air supply is limited, and carbon monoxide may develop.

Another danger—when fires have started, explosions have occurred from bat guano.

4—a In the Pyrenees Mountains in Spain, the Grotto Casteret is about 9,000 feet in altitude.

Ice caves usually result when cold (below freezing point), dense air sinks into a cave and freezes the water already present.

5—b During one of the great glacial periods, their ancestors were trapped in Mammoth Cave when the water receded. After countless generations, their eyes, being useless, disappeared. Not only have they lost their sight, but also their color, which is no longer needed for protection.

6—c Hibernating bats maintain a temperature just a little higher than



that of the cave. When they're awakened, their bodies use their stored fat up quickly to warm up. When their energy supply is depleted by their having been awakened in the wrong season, they starve to death as there are no insects around in winter.

Usually a cave bat's teeth aren't strong enough to break your skin, and as they use "sonar" to fly, they aren't apt to get in your hair. Actually, cave-dwelling, insect-eating bats are not only harmless, but helpful to mankind.

**7—a** N.S.S. smoked near the entrance lets other cavers that may follow you know that you are recording the cave in the files of the N.S.S. *Don't* smoke your own name.

**8—b** Sea caves are formed by the wave action of water. Usually they are associated with the sea, but wave action takes place in large lakes, too. Salt Lake is all that is left of Lake Bonneville, which once covered 25 percent of Utah. The zone of wave action varied with the chang-

ing lake level and formed caves. Clinton Cave in Utah is formed in limestone, not by the usual dissolving action of acid water, but by the force of wave action. Therefore, there are no stalactites or stalagmites in Clinton Cave.

**9—a** You have to be a member of a recognized research team to collect mineral or animal specimens in a cave. You can't take even broken specimens from caves in our National Park System. There's a stiff penalty under federal law.

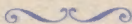
**10—c** A cave is "dead" when water seepage stops. Crystalline formations lose the water of hydration and become flaky and dry. Speleothems lose luster and cease to grow.

### Scoring your answers:

**9-10 right**—With all your knowledge, you belong underground!

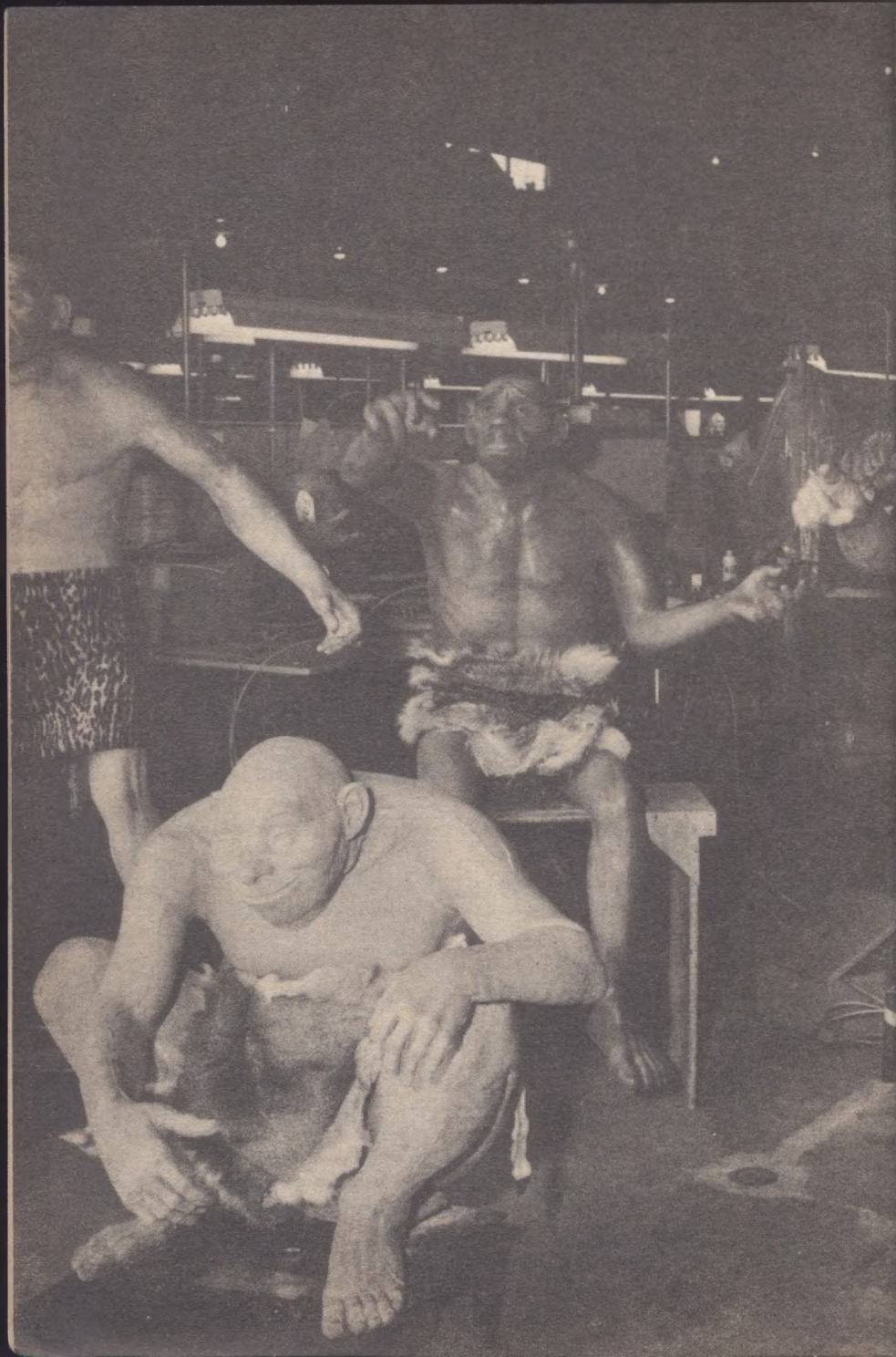
**4-8 right**—At least you know more than the average subway rider.

**0-3 right**—Maybe you're a mountain-climber at heart!



### Why cats purr

"CATS purr for the same reason human beings smile. They are happy or they are mixed up," says Dr. Paul Leyhausen. He is chief of the animal psychology department at West Germany's Max Planck Institute, where scientists have spent 10 years studying the cat's purr. There is a rigid class system among cats, Dr. Leyhausen explains. Lower-class cats purr at higher-class cats to climb the social ladder. Upper-class cats purr at lower-class cats to gain companionship. Kittens purr to show they are happy. Thus an old cat that purrs too often is showing "a regression to kitten-like behavior." It is pretending it is a kitten again "to ward off potential danger, as if to say: 'You must not hurt me. I am just a little tiny baby.'"







## PREVIEW OF DISNEY'S WORLD'S FAIR SHOWS

**T**HE 1964 New York World's Fair will feature exhibits from many lands, but it's safe to predict that the most popular will be those created by that master of ingenuity and imagination—Walt Disney.

A number of exhibitors have commissioned WED Enterprises Inc. (Walter Elias Disney) to help design their attractions.

Star performers in the Disney-designed exhibits will be life-like plastic figures (left) powered by a new system of animation called "Audio-Animatronics."

The figures are driven by magnetic tape machines. Sounds as well as movements are "programmed" onto the tape. As it plays, sounds come from speakers in the figures. Each sound impulse triggers a valve, shooting air through tubes connected to springs that work like muscles to make the figures move. With life-like reality, the system will reproduce delicate motions.

Here is a preview of the Disney wonders you'll see when the Fair opens on April 22.



Distant past (above) and dazzling future (right) pass in review in "Magic Skyway" ride. Visitors will travel in full-sized Ford convertibles. Some of the dinosaurs will be over two stories high. At the Disney studios in California (below), a group of automatic cavemen try to haul off a model elephant. All of them will be hauled to the Fair.







## Past, present and future in 12 minutes

FOR the "Magic Skyway" ride at the Ford pavilion, one of Disney's four Fair shows, you step from a moving ramp into a 1964 Ford.

Your car first passes through a transparent plastic tunnel, which winds around the outside of the pavilion, giving you an unimpaired view of the fairgrounds.

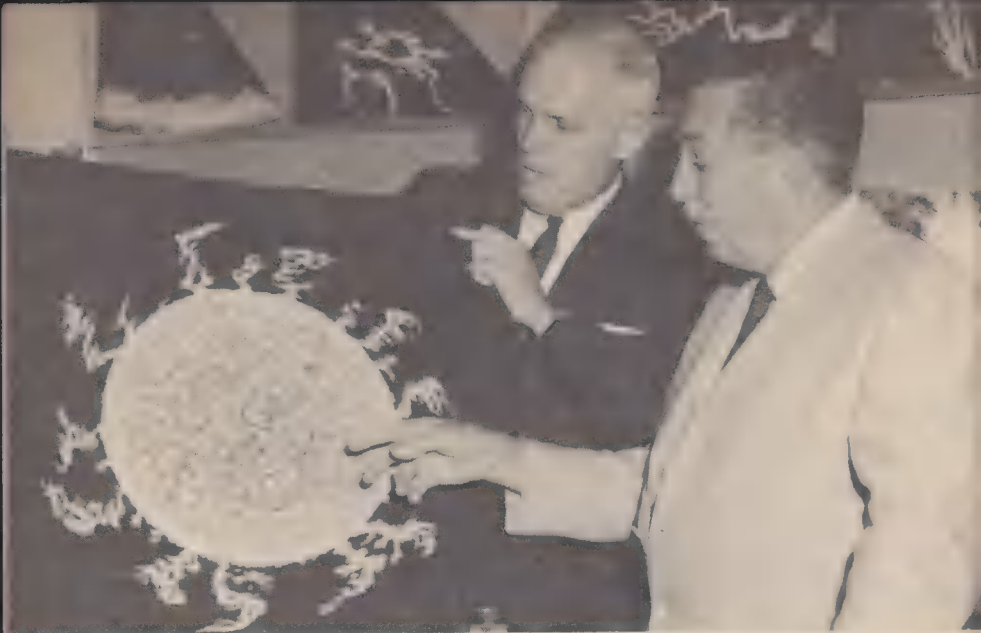
Then back into the pavilion and back—way back—into a Disney-created prehistoric world. Huge dinosaurs munch strange vegetation. From above, you are menaced by flying reptiles. You're quite safe, of

course; these Audio-Animatronic figures just bluff, never bite.

You pass man's early ancestors and watch them hunting and making a fire. You hear the grunts that marked the start of language.

As the car moves on, you come upon familiar scenes of today's world. Another transformation and you are in a gleaming world of the future as imagined by Disney.

Still another change pulls you back to the present, but for real this time—the ride is over, a trip through time in just 12 minutes.



Walt Disney (above right) shows a General Electric official an artist's conception of one of the effects featured in the Sky-Dome Spectacular portion of the G.E. show, to be housed in the G.E. pavilion (see model below). The diagonal tube in the middle is the "time tunnel" which brings visitors from the revolving auditorium on the second floor. A left turn takes them through the "corridor of mirrors" to the Sky-Dome, where a forces-of-nature display will be projected on a giant screen above them.





## 1,500-seat carousel

**Y**OUR tour of the General Electric exhibit starts on the second floor. You seat yourself in a 1,500-seat auditorium, and watch a three-minute show depicting the role of electricity in America around the turn of the century, all acted by Disney's automatic figures.

There's another show right next door, but don't get up. The whole auditorium revolves and takes you there. In six stops, you get a review of electricity in America.

For the next part of the show, you walk a short distance to a moving ramp which carries you through a weirdly lighted "time tunnel" and deposits you on the third floor. Here you walk through a modern "corridor of mirrors" and into the main feature of the exhibit, the Sky-Dome, the largest screen ever built.

Underneath this dome, the awesome forces of nature are projected. A thunderstorm crashes about you with startling realism. A fire rages, and finally the sun appears and grows from a small spot until a solar storm fills the entire dome.

When the storm is over, a narrator steps out and invites you to walk down a ramp to the first floor for a demonstration she assures you is absolutely safe. This is the finale, in which you witness a nuclear fusion experiment—a man-made replica of the forces that made the sun and the stars.



Disney and one of the Audio-Animatronic actors in his G.E. show. The figures will demonstrate the progress of electricity in America. A revolving auditorium will turn the audience from one scene to the next.



The Pepsi-Cola exhibit, "It's a Small World," will be marked by the colorful 120-foot "Tower of the Four Winds." Inside will be a Disneyesque world where models of children and animals will depict the life and languages of the various "countries" visited.

## Around-the-world cruise

THE "Tower of the Four Winds," at the entrance of the Pepsi-Cola exhibit, will probably be a Fair landmark, since the decorative 120-foot structure is visible from almost anywhere on the grounds. Within its graceful structure, scores of stylized birds, fish and animals will spin in the breeze.

The exhibit itself is "It's a Small World," a Pepsi-financed, Disney-created salute to UNICEF, the United Nations International Children's Emergency Fund. The show is a cruise aboard one of 53, 15-passenger boats that will take you around the world in nine minutes.

There are no rough seas to cross. Jets of water push the boats gently down a canal that runs from country to country. You pass Disneyesque versions of the British Isles,

Continental Europe and the Mediterranean countries, Africa and the Middle East and Far East, South and Central America.

In each of the countries, Audio-Animatronic children will entertain you with songs and dances of their lands. Animals of the various countries will also take part in the performance.

Near the end of your trip, representatives of all countries will get together for a grand finale.

Like every other world tourist, you'll probably want souvenirs. You'll be able to get them at a UNICEF booth dispensing books, games and records from various countries and UNICEF cards, posters and maps.

Each day, a different country will be honored at the exhibit.



## The living Lincoln

At the State of Illinois exhibit, you will meet that state's most famous son, Abraham Lincoln. He looks like a well-made wax dummy, until he gets up, clears his throat, moistens his lips with his tongue and delivers excerpts from Lincoln's famous addresses, with appropriate gestures and facial expressions.

You may suspect that the figure is a heavily made-up actor, but it's not, it's another of Disney's Audio-Animatronic creations. It is the most life-like automatic figure of them all. Lincoln has 22 different motions—15 of which are facial expressions ranging from a frown to a genial wink.

The figure's instrument-filled skull is covered with a flexible plastic skin, molded into a life mask of Lincoln. The eyes were supplied by an artificial eyemaker, and the hair is real human hair.

Shake Lincoln's hand; its texture is enough like real flesh to make you cringe. It's moist, for the vinyl plastic skin exudes a fine oil over a period of time. The plastic even bruises.

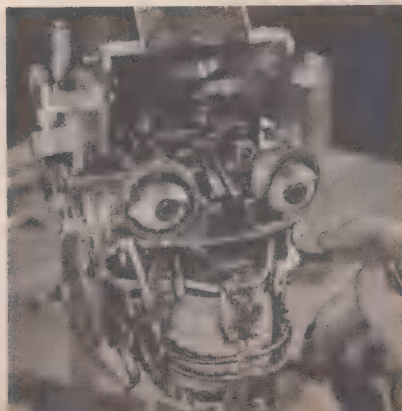
The 1964 New York World's Fair will be populated with a great variety of automatic figures besides those described here. Only one will be missing, a mechanical Sally Rand. It's comforting to know that there are still a few things real people can do better.

—Daniel Cohen



Disney's automatic Lincoln (above) rises from his chair and prepares to speak. Inside Lincoln's head (below) is the maze of mechanical parts needed to control the 15 facial expressions the figure can make.

both photos © Nat. Geog. Soc.



# The Christmas syndrome

by Fritz Leiber



**It seems Scrooge-like to be miserable in this time of good cheer. But the fact is that lots of people are. Here are the psychological reasons behind those Christmas blues, and some sound advice on how to beat them.**

**T**HE season is here when each income-bearing American adult takes on his load of Yuletide tensions and smiling cheerily, but sometimes a mite grimly, sallies forth to scatter or thriftily spot around his share of the nation's five billion dollars of Christmas expenditures.

On the social and psychiatric outskirts, the lonely begin feeling lonelier; the tension-prone tighten up as pressures mount and the illusion appears of ecstatic happiness for all just around the corner; and with alcohol sales doubling in December, an estimated three million problem

drinkers heavy up their consumption for the year's longest and roughest drink-fest, while casting a contemptuous eye on the tens of millions more who will be cluttering up the bistros and bars on one of the two traditional Amateurs' Nights for Alcoholics: Christmas Eve and New Year's Eve.

It wouldn't be so bad for the average non-problem American adult if it were just the money. It is the uncounted evenings and weekends and hours of overtime that must be put in addressing one's share of the billion and a half



Christmas cards, tying onto presents the obligatory fancy wrappings or paying a deft-fingered lady therefor, writing gay Christmas notes, running Christmas errands, budgeting Christmas contributions to worthy causes, trimming one or more of an estimated 28 million Christmas trees (that makes about three billion ornaments, I'd think), and doing the thousand and one other Christmas chores that are supposed to make us all merry.

### The good fight

As a Beverly Hills psychoanalyst rudely expressed it, "Christmas puts the damndest demands on everybody."

Statistics present the tension-swamped with one unexpected tidbit of reassurance: of all the months of the year, December has the fewest suicides. But then—another mildly surprising statistic—there are fewer suicides in wartime than in peace. Perhaps the pre-Yule weeks are a kind of long-drawn-out battle. At any rate, one writer has characterized the shopping period as "a good fight for all."

It is a closer analogy to say that for some of us the pre-Christmas mood of resentful weariness-by-anticipation is a sort of seasonal ailment, akin to sunburn and frostbite. Recalling that a syndrome is "a group of signs and symptoms that occur together and characterize a disease," we can in a half-humorous half-serious spirit speak of the Christmas Syndrome.

Many of the symptoms making up the Christmas Syndrome are "overs"—overworking (especially at too many footling little tasks); overworrying; overspending; overeating; overdrinking; overcommitting of nervous energies.

Special danger signs are expectations of rewards (which may not come, or be satisfying when they do) and feelings of being forgotten.

A Chicago psychologist lists four human types susceptible to the Christmas ailment:

*The Perennial Children*, who look wistfully back to the time when they were children and Christmas simply something to enjoy, and who resent the fact that as adults they must now buy the presents instead of receiving them, and do all the planning and work. Understandably—no one but a child really enjoys growing up. Closely related are the *Christmas Princesses and Princes*, who expect all other adults to jump to and make excitement for them.



Some resent the fact that they now must buy presents instead of receiving them.

*The Neurotic Overcompensators.* The psychoanalyst Alfred Adler first pointed out that the person with a deep sense of inferiority often tries to conceal it by setting up super-human standards of performance for himself—in short, by overcompensating. A man may demand of himself that he simultaneously succeed as breadwinner, community workhorse, and intellectual light; a woman, that she be mother, career girl, and glamour queen. So long as they fulfill the double or triple job they have set themselves (and they may manage it for surprisingly long periods), they are pictures of emotional health; but then one thing too many is attempted; there follows failure and a more or less serious emotional collapse. (Of course some people just have a lot of energy and brains and aren't necessarily neurotic because they seem to tackle almost everything.)

The Christmas Season with its endless opportunities for taking on extra responsibilities tempts the neurotic overcompensator to over-extend himself.

*The Status Seekers* are more obvious in their aims and suffer their main hurts in the pocketbook. Christmas simply provides them

with one more chance to give more expensive presents to a larger range of people, and to incur more Yuletide expenses of all sorts than they can afford. The American Indians of the Northwest had a custom called potlatch: someone receiving a present felt obligated to give a finer one in return; when two families were resentful of each other, a mutually ruinous feud of present-giving would result. The Christmas status seeker is apt to suffer the same fate.

### Increased responsibilities

*The Tension-Prones* are a larger psychological family: folks who like to live in an easy rut, yet feel guiltily impelled to do "what is expected of them." These are the people who are troubled by success and promotion, because they recoil from the increased responsibilities involved. The holiday season bothers them for the same reason.

Most of us have a little of all these flawed behavior patterns. How then are we to get through the holiday season with a minimum of strain? Here is the consensus of advice:

1. *Know Christmas for what it really is:* not only a spiritual and re-

**America is a business society  
and Christmas is its chief holiday.  
So don't wear yourself out  
fighting commercialization; it's futile.**

ligious holiday of love and unselfish giving, but also a characteristically American cult or celebration of family unity and affection, brotherhood, national business optimism, and confidence of continuing prosperity. As anthropologist Margaret Mead puts it: "We are a business society and know that all trading societies have depended on people's willingness to buy for special occasions. . . . Into this holiday, which is a national holiday which stretches from Christmas Eve to New Year's Day, we have put a kind of carefully calculated reciprocal giving where every obligation is measured as minutely as if we were South Sea Islanders exchanging dogs' teeth and pigs' tusks, or the California Indians who counted a man's worth in terms of how much was paid for his mother."

### Commercial Christmas

2. *Don't wear yourself out fighting the commercialization of Christmas*, which although relatively new is firmly established. James H. Barnett of the University of Connecticut explains how it came about in his book *The American Christmas: A Study in National Culture*: "The studied exploitation of the festival did not develop fully until the third decade of the present century.

"This came about as an indirect result of the abnormal demands made on industry and commerce by World War I, which caused large-scale expansion both of the productive and distributive facilities of

the nation. At the close of the war in 1918, the American economy was geared to a high level of output, and a host of new products were ready to be sold. However, consumer demand was shrinking, and there was serious danger of a stagnant market.

### Exploited after 1920

"In this dilemma, business leaders sought some means of increasing normal, peacetime buying, and turned to promotion and high-pressure sales methods. Both merchants and advertising agencies recognized the commercial potentialities of folk festivals, and began to exploit these occasions shortly after 1920. This was immediately successful and has continued unabated to the present."

It is futile and probably foolish to expect businessmen to forego or much moderate such a lucrative selling mechanism.

But even as the chief holiday of a business society, Christmas has its good points. More than any other institution, it identifies America throughout the world. We can gripe at aspects of Christmas and gain some emotional release thereby, just as soldiers traditionally gripe at aspects of army life. (Remember the resemblance between the Christmas rush and warfare.) But we must be very clear in our heads that this griping will never abolish Christmas commercialism, any more than soldiers' griping will abolish the army.

We can't turn back the sociological clock and reform Christmas into some simpler and perhaps more spir-





Should you give money to service workers like postmen? The author believes in giving to non-family members on impulse.

itual celebration, but we can avoid needless excesses. This leads to:

3. *Pattern your family's Christmas celebrations to its needs, likes and dislikes.* Everyone seems to have his pet peeve about Christmas. With Margaret Mead it's the money-tokens given to postmen, janitors, elevator operators, doormen, garbage collectors, sometimes policemen, and the like; they seem to her too much like bribes. For William Hamilton, writing in *The Christian Century*, it's the time expended addressing Christmas cards and adding to them personal notes; he points out that the executive is apt to pass on this job to his secretary, along with some of his present buying.

For some families the chief bugaboo is status-seeking children who want everything, or rather who want the same or better presents than those received by some neighboring children belonging to a family two or three income brackets higher. My wife detests clanging bells, especially the taped carillons resounding through some shopping centers. I don't much enjoy giving presents beyond the immediate family; I'd rather give my friends and neighbors presents on impulse when I see something they'd particularly like, or when my emotions make me want to show my affection for one of them, whether it's Christmas, the Fourth of July, or Pick Your Day and Month.

### Those endless cards

Yet surely there are people who particularly enjoy giving to service workers like postmen on Christmas, and not necessarily in hopes of better service or fear of worse—maybe simply because their hearts go out to people who work in the snow, or at tiresome-seeming jobs.

I know many people who like to send cards because it helps them inventory their friendships in their thoughts. Many young parents

**Have a little Christmas fun yourself.  
Buy yourself a present,  
Show yourself a good time.  
Merry Christmas!**

would be cruelly saddened if they couldn't send out holly-framed snapshots of themselves and their regularly-increased baby brood every December. And hosts of persons, I'm sure, are more systematic than I am and would rather give their presents at a set time than scatter them throughout the year.

Christmas offers so many types of activity that we can pick and choose. None of us can do *everything*—that way madness lies!

4. *Enjoy Christmas yourself!*  
There's a bit too much of the philosophy around that children and teenagers ought to have all the fun in life, while parents and other oldsters (people over 25) do all the work—a clearly unbalanced and unbalancing creed. So prepare a little Christmas fun for yourself, whatever form you favor. Buy yourself a present. Show yourself a good time.

*Merry Christmas!*

### *A psychiatrist looks at the behavior of nations*

NATIONS view the world through varicolored glasses, asserts psychiatrist Dr. Bryant M. Wedge. Each country has its own "psychological style," he believes, and diplomats should study what it is by making use of the findings of psychiatry. So in 1962 he founded the Institute for the Study of National Behavior at Princeton.

One recent project of the Institute was carried out for the United States Information Agency. Dr. Wedge interviewed escort-interpreters who work for the State Department in its Foreign Leader Program. He reported the results recently in *SK&F Psychiatric Reporter*. He learned that sources of misunderstandings with people from other nations are many: semantics, customs, concepts and emotional expectations. Latin Americans, for instance, who know something of the American custom of dating, often expect to find widespread immorality in America, since their own social system is based on the assumption of the inevitable consequences of young couples' being alone together. One interpreter told how a Russian was insulted when his host said he'd "love to visit Minsk before he died." The Russian thought he meant he'd rather die than see Minsk.

"Diplomats from our country often ask me," Dr. Wedge said, "how they are to interpret some disturbing behavior of other governments toward the United States. For example, a diplomat in an Arab country was alarmed because the government-controlled radio poured out a steady stream of violent abuse of the West. He told me he had considered, half a dozen times, recommending that Washington close out its mission, because the propaganda sounded so threatening. 'Are we in danger here?' he asked. The problem was psychological—how can one judge what is meant by what is expressed? I had no answer, but we discussed the hyperbolic quality of Arab public speech. This hyperbole did not imply actual hostile intention." It was, indeed, just "psychological style."

# What to take for **PAIN**

by Bruce H. Frisch

**We are being inundated by nonprescription painkillers—some good, others better, some no good at all—and a few are downright dangerous. Here's a modern guide.**

**A**FTER an evening of watching painkiller commercials on television, you have a splitting headache. You open your medicine cabinet and, through a haze of pain, spot the bottle of aspirin.

"I wonder if that New Super Rاسputinate they were talking about on TV wouldn't be better," you think. "After all, those people who work on wonder drugs must have come up with something better than plain old aspirin."

As a matter of fact, in the past few years there has been a lot of research on mild analgesics, or painkillers, and on pain itself.

According to modern theory, pain depends on the strength of the pain signal your brain receives and on your attitude toward pain. Raw information flashes to the brain in the



form of pain signals through the nerves. Depending on how the brain interprets the signals, you can feel an excruciating stab—or nothing.

This opens two avenues of attack for painkillers: one, the physical blocking of signals, and two, inducing the brain to decide things aren't as bad as they seem.

Powerful painkillers, such as narcotics, work both ways by acting on the whole brain. The resulting feeling of well-being makes these painkillers psychologically addictive. People like the feeling, want it again, and soon can't give it up. Some are also physically addictive. The body chemistry comes to depend on them and acts up violently when they are withdrawn. Morphine is an example of a drug that works on the whole brain. It can reduce pain up to 75 percent. Half its action may be through the mind.

Human suggestibility can give anything some of this action. That is why analgesics are tested in competition with placebos (non-medicines which the patient is told are the real thing). A British physician has suggested that his colleagues put the placebo effect to work when aspirin doesn't help by trying a chemically identical, more expensive brand with an impressive wrapper.

Mild painkillers that you can buy without a prescription act only on the brain's signal-receiving portion.

The two reigning families of mild analgesics are the para-aminophenols and the salicylates.

Acetanilid is the original para-aminophenol, but has such serious

side effects, especially a tendency to change red blood cells into a form unable to carry oxygen, that its derivative, phenacetin (chemical synonym, acetaphenitidin), has taken its place. Phenacetin produces the same side effects, but they are less frequent and severe.

After absorption into the body, phenacetin is changed to paracetamol (chemical synonym, acetaminophen). Thus, it is claimed, paracetamol (Apamide, Lyteca, are two brand names) is just as effective as phenacetin, yet will not change the red corpuscles.

Phenacetin fell into disuse some years ago, as aspirin gained favor, until the two were joined in the myriad APC remedies—aspirin, phenacetin and caffeine (BC, Tabloid Empirin Compound). APC is an intermarriage of the aminophenol family with the salicylate family, represented by aspirin. Like the aminophenols, salicylates relieve pain and lower fever. In addition, they reduce swellings. In APC, phenacetin usually replaces half the normal dose of aspirin. Claims have been made that this produces less stomach irritation. There have been other claims that aspirin and phenacetin work better together.

Tests sponsored by the Federal Trade Commission (FTC) upset both claims. Five popular remedies were compared: two brands of plain aspirin (Bayer, St. John's), one of aspirin buffered to reduce stomach acidity (Bufferin), and two kinds of APC (Excedrin, Anacin. Phenacetin has since been taken out of Ana-

## Aspirin can have side effects on some, so it's being coated, buffered and added to —mostly with unimpressive results

cin.) All were equally effective as painkillers and worked equally fast. APC caused more gastric upset, not less, than aspirin.

APC also pops up in a whole host of cold remedies combined with antihistamine (Coricidin, Inhiston-APC), with antihistamines plus anticongestants (Dristan) and with other symptom-relievers.

Recently there have been an increasing number of reports implicating phenacetin with kidney disease, sometimes causing death. Dr. Louis Lasagna of the Johns Hopkins Medical School, a prominent researcher on pain and analgesics, who took part in the FTC tests, claims there is a "question of advisability of the widespread use of the many APC compounds, particularly when their superiority to aspirin alone has not been conclusively demonstrated."

However, the Food and Drug Administration pointed out that the victims of possible phenacetin poisoning had taken massive daily doses for years, and that under normal circumstances it was extremely safe.

The fact is that even aspirin, like almost all drugs, can have serious side effects in those who abuse it or in rare sensitive individuals.

Aspirin's most troublesome effect,

gastric irritation, has inspired a flock of aspirin-like substitutes.

Aspirin is acetylsalicylic acid. In the stomach, it forms acetic acid and salicylic acid. Aspirin irritates the stomach lining, causes possible stomach upset and usually some bleeding. To the average person who slugs down an aspirin or two every once in a while, this is no worry. To susceptible persons, those who have peptic ulcer and those, like arthritis sufferers, who have to take aspirin continually, it is.

The product most widely advertised as an answer to stomach upset is buffered aspirin (Bufferin, A-C-K). Under tests, it has not lived up to claims made for it. So far in clinical trials, buffered aspirin has not changed stomach acidity or lessened bleeding.

Alka-Seltzer, which works on a similar principle, passes with flying colors. It is aspirin and a large dose of sodium bicarbonate. It markedly cuts stomach acidity and significantly reduces bleeding. At the same time, it speeds stomach emptying and thus shortens its span of effectiveness. And continued use—around ten tablets a day—causes diarrhea.

Dr. John J. Bonica, Professor of Anesthesiology at the U. of Washington Medical School, claims in *Drugs of Choice* 1962-63 that aspirin

causes gastric irritation through its effect on the central nervous system. If this is so, remedies aimed at lowering acidity are on the wrong track. Fast emptying of the stomach may be the real reason why bicarbonate of soda reduces bleeding, Dr. Bonica says.

Several products operate on the theory that if you can get the salicylate through the stomach intact and into the intestine there will be no irritation.

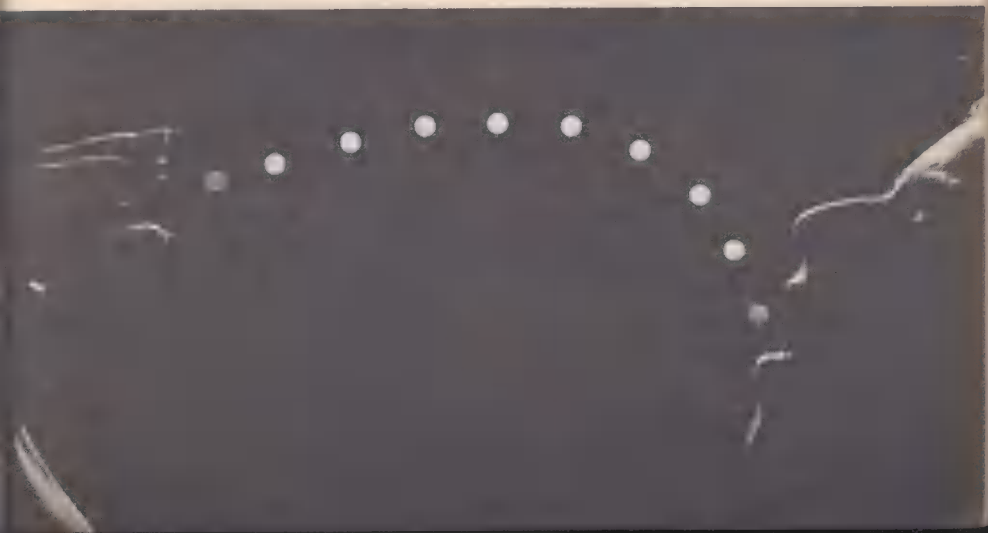
A team at the U. of Leyden, Netherlands, Hospital, under Dr. L. Stubbe, found that various coatings for protecting the aspirin as it passes through the stomach stopped bleeding. Dr. Bonica warns, however, that coated aspirin (Ecotrin) may be incompletely disintegrated and absorbed in the intestine.

Hitting the problem from another angle, pharmacologists have developed several nonacidic products. Two of these were checked at the Hammersmith Hospital and Postgraduate Medical School in London

by researchers headed by Philip H. N. Wood. Wood found that one of these products, aloxiprin, which remains stable until absorbed, reduced bleeding. On the other hand, aspirin anhydride made no difference, was slower acting than aspirin and reduced pain less.

The low solubility of aspirin may be to blame for gastric distress. Undissolved chunks in the folds of the stomach could create irritating areas of high concentration. Special forms of salicylates, called soluble aspirin, are claimed to irritate less because they are dilute and are absorbed faster. Wood could detect no less bleeding when using one kind which forms calcium acetylsalicylate in water (Disprin, Solprin). Dr. Wallace D. Hunt, a Seattle pediatrician, got good results with another form, choline aspirin (Actasal, Arthropan). However, both Drs. Lasagna and Bonica doubt whether choline aspirin is as good a pain killer as plain aspirin.

One other approach was inspired





by the fact that a small portion of aspirin is changed by the body into gentisic acid, which some thought might account for aspirin's pain-relieving power. Remedies based on gentisic acid (Casate Sodium, Gentasol) are sold with the claim they will provide the pain relief of aspirin without stomach irritation. The gentisic acid theory is now generally disbelieved.

The cheapest alternative to aspirin is plain sodium salicylate. Dr. Stubbe found it stopped bleeding, but Dr. Lasagna terms it "inferior" to aspirin.

Salicylamide (Amid-Sal, Salrin) is frequently substituted for aspirin in APC compounds. During Dr. Stubbe's tests, salicylamide stopped bleeding. However, it is considered less effective than aspirin, and possibly without any pain-killing power. One problem is that it is excreted so fast it builds up a concentration in the blood only one-eighth to one-quarter that of aspirin.

A third family of analgesics, the pyrazolons, can cause skin eruptions, sores in the mouth and throat, a drop in the number of white blood cells, and other serious symptoms. Dr. Bonica cautions, "These drugs should not be used as analgesics." The antipyrine form of pyrazolons is found in a few nonprescription preparations (Felsol, Capudine).

Standing between aspirin and morphine in pain-killing power is codeine. Since it is addictive, only small doses can be put in nonprescription drugs. A typical product may contain between one-eighth

(Trigesic with Codeine) to one-half grain (Codempiral, Anexsia) plus APC. In such small amounts, it probably has negligible value. The usual effective dose is about one grain by injection. By mouth, even the usual dose of codeine is no more effective than aspirin, according to Dr. Lasagna.

Another group to use with care is the bromide sedatives. They have generally been replaced by the barbituates because of their toxicity and slow action. A few products, Bromo-Seltzer, for instance, still contain them.

There is a clear lack of miracle pain-killers. The whole field of analgesic research has "a murky cast provided by past failures to come up with drugs that are significant improvements over older agents," in the words of Dr. Lasagna.

Out of the babble of conflicting claims, a few simple rules emerge:

If aspirin upsets your stomach, try phenacetin. Or taking the aspirin with a meal may do the trick.

If aspirin gives you a rash, again phenacetin may be the answer.

If you can't swallow pills, the soluble salicylates should help. Alka-Seltzer is cheaper. It is cheaper yet to crush the aspirin and mix it with something tasty.

In general, the other salicylates are not as good analgesics as aspirin. The para-aminophenols are somewhat less safe, and the pyrazolons and bromides are much less safe. Codeine is ineffective in doses available without a prescription.

Aspirin is still best.



KFS

Terrible and capricious, San Francisco's earthquake of April 18, 1906, shattered the City Hall, yet curiously left the building's dome standing, almost intact.

# California's coming earthquake

by Vincent H. Gaddis

**Tension is building up beneath the ground in the great San Andreas fault. Scientists believe that a major earthquake in Southern California is not only due but overdue.**

**C**ALIFORNIA, our most populous state, is preparing for a date with disaster.

Within a vast crack in the earth soil is an arsenal of earthquakes, with the potential destructive power of thousands of atomic blasts. It's the San Andreas fault, a sleeping giant that time will trigger.

Adding to its menace are its tines or branches, a latticework of secondary faults like the Garlock, the White Wolf and the Hayward. Some of these tines pass below

heavily-populated areas like Long Beach and San Bernardino.

The scientists who know the most about the San Andreas are at the California Institute of Technology. In co-operation with the University of California and under the supervision of the U. S. Coast and Geodetic Survey, they operate over a score of earthquake stations that stand watch over the fault. They are assisted by thousands of citizen volunteers who fill out questionnaires after each minor quake.

What about a major earthquake? When will it come?

"It could be tomorrow," says Dr. Hugo Benioff, professor of seismology at Caltech, "or it might not come for years. We do know that strains have been building up for more than a century along the southern part of the San Andreas fault."

Some scientists believe that a severe shock is not only imminent, but overdue.

Surveys disclose that earth movements are now in progress. The land mass on the coastal or west side of the fault is moving northwest.

"Currently this movement is very slow—about two inches a year," reports Dr. Clarence R. Allen, Caltech geologist. "But the strain between the two interfaces of subterranean rock is building up. Something's got to give before long."

### Once a century?

When it does, Allen adds, the land on the west side of the fault will snap northward many feet.

Records of major quakes do not go back far enough for scientists to determine if there is a cycle. However, by calculating the strain resistance of subterranean rock and allowing for the annual slippage, it appears that the critical point is reached about once a century.

Dr. Allen suggests that the San Francisco earthquake of 1906 apparently eased the strain along the northern part of the fault. Thus another serious quake in this region

may not occur until around the beginning of the next century.

"The last big quake in the southern part of the fault, however, was in the Ft. Tejon area a hundred miles north of Los Angeles in 1857. Assuming it takes about a century for the strain along the fault to build up to the breaking point, we're overdue for a big one in Southern California," Dr. Allen says.

Dr. Charles F. Richter, Caltech seismologist and an authority on earthquakes, believes it is probable that the next big quake will take place between Paso Robles and the Mexican border, probably near Ft. Tejon.

Dr. Richter's second probable location is central California, north and south of San Francisco; and his third, the area from Paso Robles to Hollister.

A survey six years ago revealed that two-thirds of the nation's leading geophysicists believed that a major earthquake was due in California. Only minor shocks that do very little to relieve the fundamental strain have occurred since the survey.

The impending quake is expected to move the earth mass west of the fault at least 20 feet. The movement that caused the 1906 San Francisco earthquake was about 20 feet, while the rupture in the Ft. Tejon quake over a century ago was 21 feet.

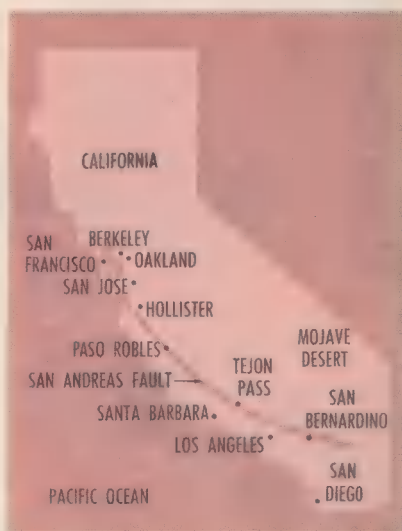
Since 1906 the coastal land mass has moved about ten feet. Only the friction between the mainland and the western mass has kept the dis-



THE SAN ANDREAS fault has an overall length of probably 2,400 miles. It begins in the sea some 60 miles off the Oregon coast and runs to the Gulf of California. As it cuts through California, it passes some of the state's most populous areas.

The fault extends for about 650 miles through the Golden State.

Scientists feel that the San Francisco quake of 1906 eased the strain on the fault in the central part of California. They note, however, that there has been no major adjustment in the San Andreas in the southern part of the state for over 100 years. This has led seismologist Dr. Charles F. Richter to predict that the next major quake along the fault will take place some place south of Paso Robles.



placement from being greater and moving faster. Inevitably, the friction will not be brake enough to prevent a major adjustment.

There is an almost constant rubbing and grinding between masses of subterranean rock. Shock waves are transmitted in all directions. Some can only be detected with seismographs; others are strong enough to rattle dishes.

Scientists cannot prevent an earthquake, nor can they predict just when a major shock will occur. Advance planning, however, can minimize its effects and save many lives.

California state and municipal officials are well aware of the San Andreas. Their concern has increased as more and more scientists

have added their voices in a grim warning that the next big one is not far off and, as Dr. Richter says, "Californians are going to have to live with the threat of a great earthquake."

What is being done in preparation for the coming disaster?

Recently this writer made a survey along the coast, with special attention to San Francisco and Los Angeles.

On April 18, 1906, one of the greatest shocks in American history struck San Francisco. It happened at 5:12 on a weekday morning when the downtown business district was deserted and streets were empty. The death toll was between 452 and 498 persons.

Actually the quake buckled and



KFS

When the earth beneath San Francisco moved in 1906, it snapped underground gas and water lines. Fires started in gas leaks and loss of water made them impossible to put out.

rolled over a 200-mile stretch of the San Andreas fault. Altogether, at least 700 persons were killed.

San Francisco's damage was estimated at \$400 million at a time of 5-cent beer and 15-cent prime beef.

What if a quake of similar strength struck at noon on a week-day? It is a chilling possibility.

### San Francisco is ready

Yet the city is ready—and it seems unlikely that any future disaster would reach the proportions of that of 1906.

Tough building laws provide for rigid inspection and strict enforcement. The city is far more quake-

proof and fire-proof than it was in 1906. Fire-fighting methods, procedures and equipment have greatly improved.

Since ground shocks roll in only one direction, San Francisco has duplicated its primary water supply lines. One runs into the city in a north-south direction, the other is laid east and west.

Within the city a complex system of secondary lines and numerous valves insures that water will not be cut off because of a break in any one line. Firemen and utility employees have been carefully briefed on what to do if various situations arise.

Two large pumping stations have

been built along the waterfront to pull water from the bay. As an additional precaution, dozens of cisterns containing thousands of gallons of water have been installed under strategic intersections.

Gas lines have been laid using a plan similar to that of water mains. This plan permits gas to be cut off at any one of hundreds of valves, thus limiting the possibility of gas fires. Emergency repair trucks stationed throughout the city are kept ready to roll.

Wherever utility lines cross the fault near the city, emergency supplies of replacement materials, equipment and tools have been cached in stations located on both sides of the fault.

Karl V. Steinbrugge, secretary of the Seismological Society of America and a structural engineer, believes that even if San Francisco was hit by a quake of the magnitude of 1906, it would result in much less damage.

"San Francisco is in pretty good shape," he concludes.

Los Angeles County maintains a disaster office that supervises preparations by all relief agencies in the area.

Recently Dr. Richter warned the office that the major risk of a strong earthquake is not the shock but panic that may follow.

"This is particularly true in this area," Dr. Richter said, "now that our population includes so many new residents who have had no experience with a strong earthquake."

He added that quakes are more

severe on soft ground (similar to that around Los Angeles) than on hard, and that towns on soft ground up to 60 miles from a major quake may be damaged. Most heavily-populated parts of Los Angeles are about 30 miles from the San Andreas.

The problem of panic has plagued Los Angeles traffic officials in recent years. But Greater Los Angeles has more motor vehicles per capita than any city on earth—one for every three residents—and the number increases daily. In a panic a tremendous traffic jam would tie up all traffic within minutes.

What about downtown Los Angeles, which many seismologists believe may be affected by the next major earthquake?

Many of the larger older buildings in Los Angeles featured an eastern architectural style of cornices around the roof lines and ornamental stonework.

### Old timers are careful

In more recent years Los Angeles has been busily enforcing its building code, which provides for the elimination of all excess masonry, cornices and facades from buildings.

In addition, the code calls for extra amounts of protective reinforcement in constructing new public buildings—schools in particular.

Older Californians are careful to build homes where they are not menaced by quake-produced landslides. Unfortunately, some of the newer residents are not conscious of



## The San Andreas and its branches cut across the two major sources of water for Southern California, where getting enough water is always a problem.

this danger. Although codes are enforced in cities, many outlying residences, as population increases and available land decreases, are being erected in risky locations.

Since the city is not as close to the San Andreas as San Francisco and has not experienced a major quake since it was a village, earthquake preparations are not as elaborate as in the Golden Gate City.

In both Los Angeles and San Francisco, Civil Defense agencies and the National Red Cross are ready for service.

### Will there be water?

Water, always a problem on the coast, will be especially needed in Southern California if a major earthquake strikes. Although water is now being stored in many places west of the fault, great resources will be required for drinking and fighting fires.

The seriousness of the situation lies in the fact that the San Andreas and its branches intersect at several places the two major sources of water for Southern California. These sources are aqueducts from the Owens River to the north and the Colorado River to the east. They supply water not only to Los Angeles, but throughout the area west

of the desert and south to San Diego.

Water from the Colorado is carried by surface channels, not too difficult to repair in case of a break. But the Owens River aqueduct crosses the fault through underground tunnels.

Dr. Clarence R. Allen, of Caltech, points out that if the next major quake shears these tunnels, there could be a serious water shortage for several million people. It might require weeks or even months to repair the tunnels.

Work is being started on a third major source of water for Southern California, but it will be several years before the vast project is completed. This is the \$1.75 billion, 500-mile-long system of tunnels, dams and channels from the Feather River in Northern California.

Dr. Hugo Benioff is a consultant on this project. He is recommending that the water be brought to the surface where it crosses the San Andreas, and that dams and pump houses be built so that they are particularly quake-proof.

As for families living in earthquake zones, seismologists suggest they take a lesson from the quake-wise Japanese. There each member has a specific duty. At the first tremor, one cuts off electric power

into the house, another turns off the gas, and others perform tasks to reduce damage and prevent post-quake fires or explosions.

Traditional advice is to "get under something that will protect you from falling debris and count to 40." But be sure that "something" is an object not likely to collapse. Otherwise it is best to ride out the shocks in an open area, free from trees, power lines and other things that might fall.

### Nuclear blasts no help

There have been proposals that strains along a fault could be eased by nuclear explosions of the right intensity at the right time.

"Such precision is almost impossible to conceive," comments Dr. Benioff. "You might ease the strain at one point but increase it at another."

It is not true that hot, humid and calm periods are so-called "earthquake weather."

Dr. Richter says weather has nothing to do with quakes except during the start of California's rainy season. At that time—the end of summer—he has noted a slight increase in the number of small shocks. This he attributes to the cold polar masses spreading southward, increasing the atmospheric pressure against the earth.

Can cities eventually be built so they're quake-proof?

## What causes earthquakes

IT IS A MATTER of growing pains. Our old earth stretches and deforms its rock layers at a rate too fast for them to reshape themselves quietly. The sudden shudder of their breaking is the earthquake.

Scientists are not sure whether the earth is growing bigger and stretching crustal rocks, or shrinking to wrinkle them like dried apple skins. In any case, there are many reasons for the squeezing and twisting of the rocks that cause such trouble.

Chemical and radioactive reactions melt the interior materials causing pressure against the overlying rocks.

Most important may be the weight of earth material moved from place to place by the rushing waters of rivers. This happens slowly, but there is all the time in the world, and after millions of years the weight of material becomes very great.

Breaking takes place along zones of weakness called faults. One side of the rock moves past the other, sideways or up or down, sliding and grinding along the fault until the tension is released. The rock then comes to rest in its new position, to stay until tension builds up again.

—Capt. Elliott B. Roberts, assistant director for research and development of the U.S. Coast and Geodetic Survey.

Yes, say the experts.

Earthquake damage to structures has been painstakingly studied during the past half century.

"There is no reason for a fifty-story building to be less safe than a five-story building if it is constructed properly," says Dr. George W. Housner, Caltech professor of civil engineering.

Finally, will it eventually be possible to predict quakes?

An international study is now in progress in an effort to answer this question.

"With increasing information about the earth movements all over the world," Dr. Benioff says, "we might begin to see a pattern emerge which would tell us when and where the breaking point has been reached."

It can't be concluded as yet that earthquakes come in cycles because they haven't been observed or recorded long enough.

### World-wide stress system

There is evidence, however, that magnitudes of world-wide quakes during active periods are related to each other, that the release strain by one shock affects the time and presumably the strain-release of following shocks. There seems to be some form of world-wide stress system.

This complex international research that may later enable man to forecast quakes is only beginning. Dr. Benioff believes the ability to predict quakes may well re-

quire several centuries of research.

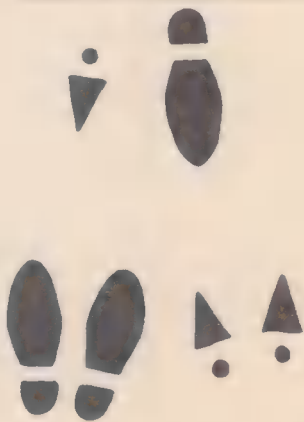
Meanwhile, California awaits its unknown date with disaster. But Californians are not worried.

San Franciscans simply ignore the San Andreas fault. They love their unique city with a fervor incomprehensible to outsiders. They wouldn't live anywhere else.

### No hurricanes in California

South in Los Angeles, despite congestion, freeways and smog, the City of the Angels has great advantages.

"Why fret about possible earthquakes?" Californians ask. "The rest of the country has floods, twist-ers, hurricanes, fires, avalanches, blizzards, epidemics and other menaces. Besides, California is a wonderful place to live."



BILL SHEPP

"Alice, meet Professor Zax—a scientist who's been doing some interesting research on female hormones."





# READY, AIM, WAIT!

by H. Hellman

Manager, Information Service  
General Precision Inc. — Aerospace Group

If you think setting a course in space means pointing your craft at its destination and just heading for it, wait till you read this simple explanation of one of space travel's most complex problems.

THE newsboy who throws a paper onto your porch uses one of two methods.

If he is on foot, he can conveniently stop while he throws and he will usually do pretty well. If he throws while riding his bike, the results are generally worse. And if the house happens to be a moving trailer. . . .

Well, we begin to see what is involved in space navigation.

Why all this talk about guidance and navigation in space? Once we're off the earth we can see our target at all times; so why can't we just point our space ship at our destination and keep aiming at it?

The answer, of course, is that all heavenly bodies are constantly moving and the only way to stay continually pointing to, for example, Mars, would be to continually change course. But this would re-

**If we were just one hour late in a trip to Mars,  
we would miss our rendezvous by 54,000 miles,  
since Mars travels 15 miles a second in its orbit.**

quire a continual expenditure of energy and if there is one thing our space craft are short of, it is energy.

Roughly, what we must do is calculate how long it will take us to make the trip, then determine where Mars will be at that time. However, it is easier to talk about such a target than to find it. Finding it involves answering two questions: "Where am I?" and "Where am I going?" The process by which these questions are answered is called navigation.

We know that the question "Where am I?" is not asked only by drunkards and amnesiacs. It is asked by anyone traveling through unfamiliar territory and is answered by the name of a town, the intersection of two streets, or perhaps latitude and longitude. The main thing is that there must be a way to pinpoint position, and it must be with respect to something that remains fixed. There must be a fixed reference point. On earth that is no problem. In space it is more complicated because the earth is traveling around the sun at something like 18.5 miles per second and we would be referring our present position to where the earth was a short time ago.

The most convenient reference point for interplanetary travel is

the sun. This is because the sun, being a star, remains fixed.

Or does it? Further investigation reveals that the sun is traveling at the rate of 12.2 miles per second in the direction of the constellation Hercules. This motion is with respect to the "nearer" stars. Then these nearer stars, together with the sun, appear to be traveling at about 170 miles per second toward the constellation Cygnus. Also, the solar system is revolving around the center of our galaxy. And finally, our galaxy is a member of the so-called Local Group (which includes the Andromeda Galaxy, the Large and Small Magellanic Clouds, and several clusters of galaxies), which rotates about a common center of mass between our galaxy and the Andromeda galaxy.

### **When the sun stands still**

Sounds like an impossible situation, doesn't it? A flight within the solar system is too short for these motions to be a problem. As far as we are concerned, the sun remains fixed in space, and we will use it as our "home base."

So far we have discussed the problem of finding our position in space, which is equivalent to obtaining longitude, latitude, and alti-

tude on earth. However, because our destination is nothing more than an unmarked point in both space and time, it is also necessary for us to know our velocity very accurately, otherwise we could never be sure of arriving at our rendezvous on time.

Even a rendezvous on earth, be it between lovers, spies, or two boys going fishing, involves time as well as a place. If one party on earth is late, no great harm is done, except to the patience of the other. But consider what would happen if we arrived at our target point a mere hour late, which is not too bad if you consider that the trip could take as much as 250 days. Since Mars travels 15 miles a second in its orbit, we would miss our rendezvous by 54,000 miles. So we must find both position and velocity before we really know where we are.

The next step is to determine where we are going. That is, in what direction are we heading or moving (sometimes called "line-of-flight"), and how does it compare to the direction in which we should be heading? Before we do this we should note the distinction between "line-of-flight" and "attitude." Attitude refers to the direction in which the ship is pointed. Since there is no air resistance in space, a vehicle in free flight, (after propulsion cutoff), can travel backward or sideways as easily as forward; hence attitude has no physical effect on line-of-flight, as it does in aircraft.

But knowledge of attitude is indispensable for celestial measurement, pointing of antennas, thrust correction, and many other jobs that must be done in space.

While it is possible to determine attitude in space, the best way known at this time is to "take it with us." A gyrostabilized platform—a platform that is isolated from the motions of the ship and stabilized by gyros—is "told" its attitude before launch and "remembers" it, regardless of the motions of the ship. The hiker and the ocean liner use compasses to tell them where north is; we carry our "north" with us.

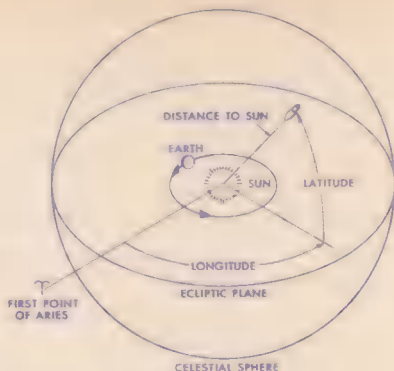
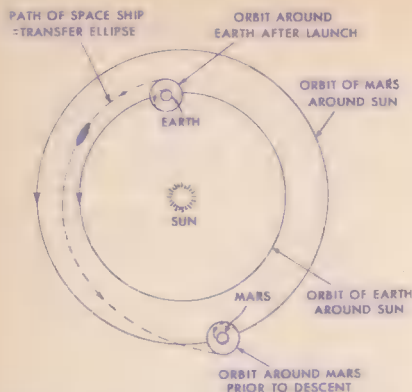
### How we navigate

With the addition of other components and electronics, the stabilized platform is converted to an inertial navigation system, the same type of system that guides both the Polaris missiles and the submarines that launch them. This type of equipment will also be our primary navigation system.

A perfect inertial navigation system would eliminate the need to take optical fixes since it keeps track of all the factors necessary to navigate a ship—position, speed, and direction of travel.

Over a long period of time, however, even the best of the current gyros drift, causing the platform and the reference to drift out of alignment. It becomes necessary to correct the platform alignment by sightings on stars or planets. This





Above, left, is a possible flight path to Mars. Initial stage is ascent through atmosphere into orbit around earth. Midcourse phase is free-flight elliptical path to Mars. Final stage is reconnaissance orbit around Mars and descent. Right, diagram of heliocentric-ecliptic coordinate system which will probably replace latitude-longitude system for space travel. The ecliptic is the plane of the earth's orbit around the sun, and the celestial sphere is an imaginary sphere of infinite radius that contains the stars as we see them. Longitude is measured from the first point of the star Aries.

is celestial navigation, which utilizes the known orientation of certain celestial bodies as a function of time and earth's position.

For example, in navigation around the earth or other planets, the measurement of the orientation of two stars relative to the center of the planet is one way to determine our position. However, to do this we must also know the direction of the planet's vertical; we can find it with such instruments as a simple pendulum or a horizon scanner, one of the new instruments to come out of the space age.

As we know, once we tear ourselves free of the planet's gravitational attraction, the planet-vertical is no longer a useful concept, and finding our position would then entail measurements on still another body. The logic of having chosen the sun as a "home base" begins to come clear, for now we can keep the "vertical" always pointed to-

ward the sun. Then, the angles made with this direction by the lines to a star and a planet are all we need to find our position.

Barring an unforeseen breakthrough in inertial navigation, the gyro-stabilized platform will be connected to telescopes and photoelectric equipment for celestial sightings. The stabilizer platform will maintain the fixed direction between sightings and the periodic sightings will act as a check on the accuracy of the platform. This will be the primary navigation system used on the Apollo flights to the moon.

Although an earthbound navigation system, in which radio equipment on earth tracks the vehicle and gives instructions, is a possibility, it probably will not be used because of long range communication difficulties. Or it may be used, as on Apollo, as a backup system. One interesting sidelight here is the time lag inherent in signal transmission.

The maximum distance between earth and Mars is roughly 250,000,000 miles. At this distance, it would take almost  $\frac{3}{4}$  of an hour, just in message traveling time, for us to ask where we are and be told where we were.

With a pre-programmed trajectory and periodic measurements of range and velocity, a relatively simple comparison of the two will determine any deviation from the proper course. For each departure from the programmed trajectory, there is a new optimum one, which immediately requires that a computer be part of the guidance system to calculate the magnitude and direction of the impulse needed to achieve the new trajectory.

### The difference between phases

To simplify the calculations involved, and because different navigation techniques and equipment are involved, an interplanetary flight is usually thought of as consisting of three phases: initial (or launch), midcourse, and terminal. For example, a trip from earth to Mars might take the form of an initial phase of injection into orbit around the earth, a midcourse phase of free flight from the earth-orbit to Mars-orbit, and a terminal phase of descent to the surface of Mars.

In the initial phase our primary concern is getting out of the atmosphere of the earth without damaging anything. One major problem is the strain of the tremendous accelerations necessary to get the

craft free of earth's attraction; another is the heat generated by the craft's flight through the atmosphere.

Equally important in this phase is accurately getting the space craft into its trajectory or flight path. The closer the match between desired and actual flight path, the less waste of precious fuel. Because of the great distances involved, the slightest error in direction or velocity of launch leads to large errors later on. Therefore it seems certain that we will have to make some corrections during the course of the flight.

Let us suppose that we have reached Mars and are now in orbit around it. Since we are a manned mission, we select a let-down spot and feed its position to the landing computer. Before leaving the orbit for descent, we turn the vehicle around until its main engines point forward—a convenient attitude for lift-off as well as landing.

We engage the autopilot at about 25,000 feet. The autopilot gets very accurate altitude information from a Doppler-radar device and triggers the braking rockets at 5,000 feet. From this altitude until touchdown, vernier rockets (small supplementary rockets with very accurate controls) control the craft's attitude, and vernier-retro rockets, the final descent velocity. Before touchdown, landing legs are hydraulically extended to act as landing bumpers and to compensate for any terrain irregularities.

We have arrived.

## Near disaster with the

THE scientific community is breathing easier over an event that, at the time, seemed to be one of the most horrifying medical mistakes in history.

It is now almost certain that a recently-discovered virus, unwittingly put into hundreds of thousands, if not millions, of doses of early Salk vaccine, will not cause cancer in human beings. But for a while the evidence pointed in the other direction.

The virus, which has been the subject of much secret medical concern, is known as simian virus 40 (SV40). When discovered in the kidney tissues of Rhesus monkeys, SV40 was considered a stray organism, one of many latent viruses that lurk about man and animal without doing any damage.

In 1961, came the frightening report that SV40 could cause cancer when injected in newborn hamsters. Alarm gripped every public health man in the country. Hundreds of thousands of children had been infected with this virus since the Salk vaccine was introduced in 1955.

Considerable comfort, however, was taken in the fact that SV40 was dangerous only in newborn ham-

sters. Furthermore, the dosage needed to infect hamsters was much greater than the children were likely to have gotten.

But the report touched off a flurry of research activity on SV40 and produced more disturbing findings: The tumor-producing property of SV40 was not limited to the hamster, it was discovered. A rat species also came down with tumors.

In August, 1962, a leading investigator found the hamster could be infected as late in life as 22 days, a period that corresponds more closely to the age of younger children who received most of the vaccine. There also was some evidence the SV virus could produce slight, non-cancerous infection in man, and when put in human tissue culture could cause some cell changes suggestive of tumor growth.

This meant a definite study had to be made of the statistics in the Salk-treated children themselves. The National Institutes of Health undertook that analysis.

Fortunately, a tidy, built-in experimental model existed because the early use of Salk vaccine was controlled. In 1954, Salk vaccine was field tested among 400,000 first-



# Salk vaccine

second- and third-grade children in 44 states. In 1955, it was licensed as a commercial product and administered to first and second graders in all states under a free vaccination program by the National Foundation. By July, 1955, six million children had been inoculated.

The stored specimens of the vaccine lots were available in Washington. They were analyzed for simian virus content and matched against the death rates in the various states.

The results, published in *The Journal of the American Medical Association*, were gratifying. They showed the mortality rates in cancer have been no greater in the four years since 1955 than in the four before.

There is a slight increase in leukemia, but the same increase is shown in states receiving no SV40 in the vaccine.

"There is no reason to suspect the slight increase in leukemia mortality rates is related to SV40," said the experts, Dr. Joseph F. Fraumeni, Jr., medical officer, and Dr. Robert W. Miller, chief of the epidemiology branch of the National Cancer Institute.

The comparisons were made only to 1959 because complete vital statistics are only available to that point.

Since the incubative period of a potential cancer virus may be longer than four years, continued surveillance will be necessary.

It would be premature to conclude that SV40 is harmless, Dr. Fraumeni says, but the lack of effect thus far is highly encouraging.

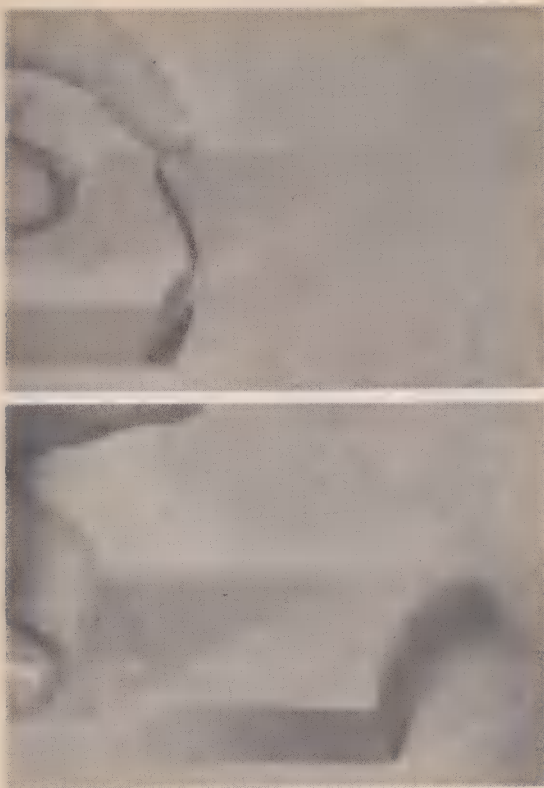
SV40 also has been involved in the early Sabin vaccine. It may be included in further study. Since its discovery, however, SV40 has been rigidly excluded from both Sabin and Salk vaccines.

Comfort can also be drawn from an event in the 1930's when several million people were vaccinated against yellow fever virus.

This virus was propagated on chick embryos. Years later it turned out that chickens harbor one or more viruses that produce cancer in chickens.

These presumably went into the vaccine that treated millions of people, but there is no evidence of an increase in cancer incidence in this group.

—Arthur J. Snider



## Up and over

**H**ERE'S a little trick that shows the effect of spin inertia. All you need is an ordinary matchbook.

Carefully tear out all the matches. Give the matchbook a curved shape by bending it with your fingers.

Hold the matchbook, in an upright position on the table, then let it go. It will roll forward and flop over in a comical way.

The explanation is spin inertia. If something is set in motion, its inertia will keep it moving if nothing acts to stop it. When you let the matchbook go, its weight made it

roll forward on its curved side. By the time it got down to the table it was turning fast and its spin inertia kept it turning. This made it roll up around its other edge and finally fall forward on the table again.

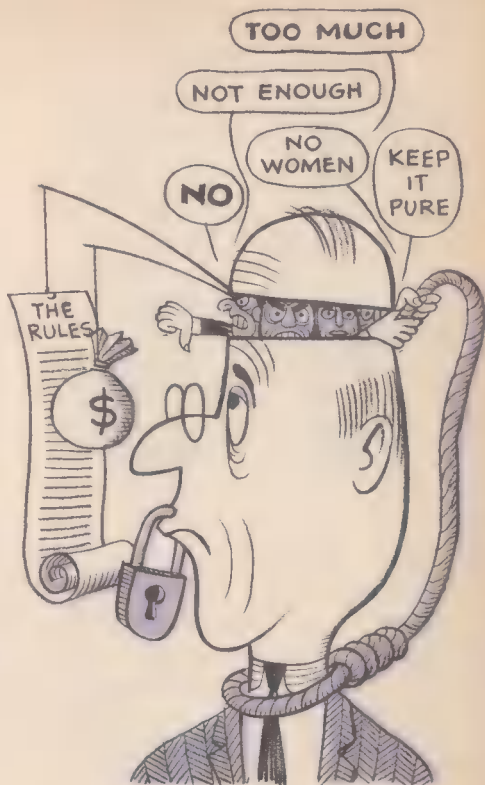
Spin inertia makes a flywheel useful for steadying the turning of an engine. The spin inertia of the heavy wheel smooths out the separate pushes from the engine cylinders and keeps the whole motor turning steadily.

The earth is a giant flywheel. It is so huge and heavy that its turning time does not change by a thousandth of a second in a hundred years.

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# Scientific freedom- HAH!

by Hilbert Schenck, Jr.



**An engineer presents a hard-hitting indictment of the state of American science today.**

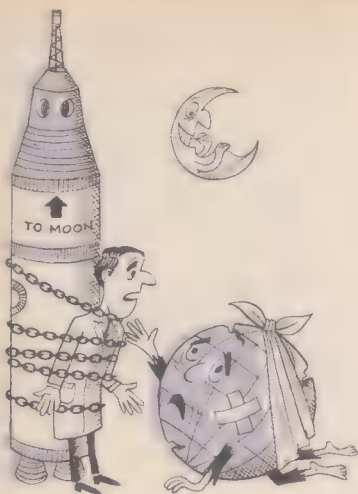
**C**URIOSITY or a search for truth has nothing whatever to do with most of modern research. Investigations are usually initiated because the scientist believes a granting agency or company front office will approve his topic.

The topic itself should be of con-

temporary interest (high-energy particles, heat transfer in rocket nozzles and tanks, studies of big-city delinquency); it should relate to previous publications by the grantee (no "fliers" into a new field allowed); and it should fit the budgetary policies of the target agency or foundation.

The proposal-writer understands that a thirty-grand request with two





**"Instead of the incredible forty-billion-dollar boondoggle of sending man to the moon, a really free scientific establishment would get on with the jobs worth doing."**

years' duration is favored by the National Science Foundation, especially if the proposal stresses generality. The Ford Foundation, on the other hand, likes to give more than this, but only to name schools and teams of people—and only if there is a relationship to education.

Far-out stuff (parapsychology, hypnotics and sleep-learning) is absolutely N.G., as is any project that solves only a particular problem (turning bullock dung into methane fuel) rather than "adding importantly to the store of human knowledge."

The degree of freedom "on the job" of the young researcher in choosing his project appears about the same as that of his Russian contemporary. Further, there seems to be no more pressure on talented

Russian youths to select a given field than on an American youngster. The state, in either case, seems content to let the grants, scholarships and other inducements regulate the supply.

As far as the female half of both societies is concerned, the Iron Curtain girls have much greater freedom to choose careers in science. According to current estimates, one-third of Russian engineering posts go to women. In the United States, lady physicists are rare birds, while distaff engineers are unheard of.

At the policy level of science, it is evident that the Russian technical leaders have more freedom than our own, for it is they who make the move and it is we who make the response.

It is they who decided on the space race and then euchred us into joining the game.

A scientific leadership that was free to move in the directions of interest and personal fulfillment

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Hilbert Schenk, Jr., teaches mechanical engineering at Clarkson College of Technology and is the author of several engineering textbooks.

would hardly have to look at our cold neighbor, the moon, for inspiration. Instead of this incredible forty-billion-dollar boondoggle, a really free scientific establishment would get on with the jobs worth doing: instantaneous spoken-word translators, cheap desalting plants, massive irrigation and weather-control methods, satellites that beam forecasts and power everywhere, disease cures and body-part banks, multiple methods of birth control, sociological assaults on poverty and prejudice, econometric studies of world-distribution patterns, unheard-of transportation methods, melting of permafrost and cooling of tropic areas, harvesting the seas.

To the ordinary person, bemused by the clean-cut astronauts and Telstar, it seems that science is indeed a wonder. I would say that if a significant fraction of the monies and technical concentration of the space and weapons efforts were diversified into applied research on world-wide problems, the current pace of scientific progress would be revealed for the irregular and halting business it really is. Furthermore, the Western nations could afford to let Russia have the moon, for they would be trading it to us for the earth—and a healthier earth at that.

Most interestingly, the scientist or engineer, immersed today in the anonymity of the bull pens, would truly and finally fulfill himself. He would be, for the first time, living up to his potential in this age of science.

Consider a small industrial group working on some tiny aspect of a space venture, perhaps an astronaut's boots. There is a heat-transfer man, a materials expert, a fabrication engineer, a group leader, some test engineers and a secretary. After six months of effort and a million dollars' worth of testing, the boot is perfect. The capsule makes its usual orbits and the astronaut goes water-skiing with the President's sister-in-law. So what?

### Better than space

Let's take the same group and the same money, but explain to it that 5 percent of the births in Honduras result in the fatality of the mother simply because there are no sterilizers available to the midwife. Now our team works out a means of making pottery autoclaves that will withstand the necessary pressure. In so doing, they learn a great deal about pottery as a heat-transfer and structural material. They may even pioneer new methods for constructing cheap medical sterilizers for all sorts of purposes. The death rate of mothers in childbirth soon drops sharply and the group leader gets a medal from Honduras. The other technical people go home at night, sit down in front of the TV and say to their wives, "I accomplished more in the last six months than the entire Cape Canaveral thing did in ten years." Who is to deny their words?

The investigator who is not concerned with application, or tech-



*"The primary myth that relieves science of responsibility, of its sense of sin, is the myth that equates science to art as an activity responsible only to the genius of an individual mind."*

nological advances, may feel that these comments do not apply to him. Yet he is both victim and staunch defender of the most pernicious of all science myths. This is the belief in the primary importance of "pure" rather than "applied" science.

This bit of folklore orders the course of scientific discovery in the following simple pattern. First, it specifies, comes our pure investigator, motivated by his curiosity. He arrives at something interesting, but apparently useless, such as a geometry of hyperspace or an odd trace in a cosmic-ray photo-bundle. Then it turns out, almost magically, that the geometry exactly predicts the path of electrons in a tunnel diode or something, while the particle is triplyionized lithium and its behavior immediately suggests a good way to construct the neutron

or "private property" bomb (it kills only people and there is no blast), or else a way to preserve cranberry juice.

Thus does pure or non-directed research add to the national wealth and well-being. Furthermore, the purists are quick to warn that improper or inadequate support of their particular area of interest will dry up the wells of "truth" from which flow the ideas that lead some day to the transistor, the washer-dryer combination and color television.

I believe this myth is almost wholly without verification by the history of science and technology. There is no evidence of a sequential process of discovery proceeding from abstract to applied science and proving that the latter cannot happen without the former. The actual situation is far more complex; it



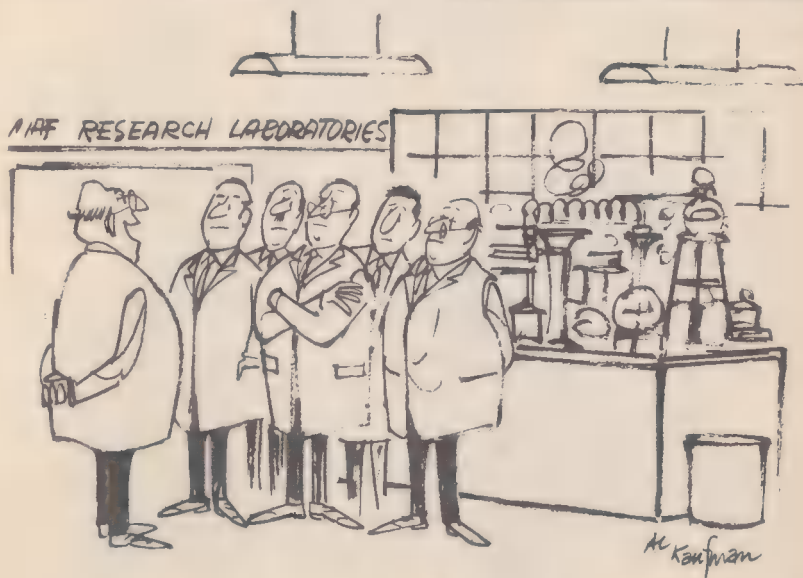
would seem most closely to resemble a kind of dialogue between the abstract and the concrete in which neither is always first.

Now why does this particular myth form a core of the scientist's belief structure? Because it is the primary myth that relieves science of responsibility, of its sense of sin. This is the myth that equates science to art as a purely personal, creative endeavor, an activity responsive only to the genius of an individual mind. When an abstract-expressionist hurls gouts of orange mud at a half acre of canvas and proclaims an artistic millenium, he does no one harm. When a group of supposedly abstract truth-seekers hurls tons of radioactive mud into the blue and pleasant sky, it is not

at all the same thing. Dr. Teller may proclaim a "spirit of adventure," but we can all think of better descriptions than that.

Myths fulfill both psychological and emotional needs. They provide the true believer with easy, stereotyped responses when strong moral action is actually required. So successful are the myths of the scientific establishment that almost no scientific conference or meeting schedules a single session, or even a single talk, on the immediate moral implications of research and the day-to-day responsibilities of scientists to their fellow men.

Without our myths, our ears would be deafened and our hearts pinched and we might finally see ourselves with a too horrible clarity.



"All I want from you, men, is a new wonder drug that will gross about twenty million."

## The double life of the Drs. Ambrus

THE picture below of a father and mother with their children is commonplace enough—but not when you look at the adjoining picture showing father and mother in their role as a nationally prominent cancer research team. The two are

Drs. Julian and Clara Ambrus, who work at Roswell Park Memorial Institute in Buffalo, N.Y.—when they are not busy rearing a happy brood aged 4 to 9 with Dr. Spock-like insight. Here is the story of their purposeful, gratifying double life.



Near their home outside Buffalo (below), Julian and Clara Ambrus enjoy an evening romp with their children, Julian, Jr., 6; Madeline, 9; Linda, 4, and Peter, 8. In their work (right), the Drs. Ambrus specialize in research in leukemia and in the physiology of white blood cells. They want to find out how blood, which is always manufacturing new white cells, disposes of the old ones. They are best known for their work with plasmin, a human blood component that may be useful in dissolving blood clots like those that often occur in cancer victims. (Photos by Alan D. Haas)

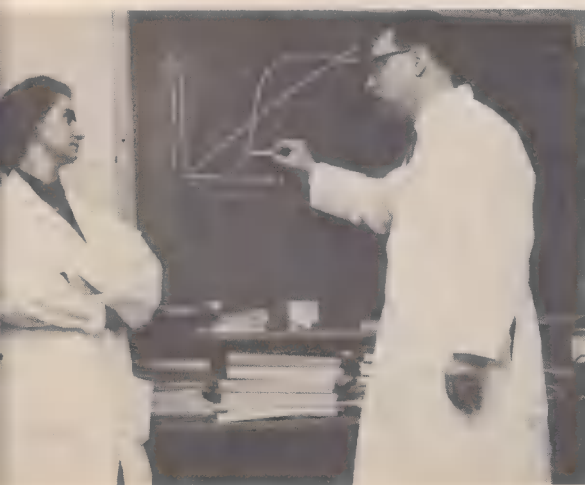








Above: After a day spent in surgery and lab work, Dr. Clara serenely reads a bedtime story.  
 Left: A giggling Linda perfects her tooth-brushing technique with her mother's help.  
 Below: Work engrosses couple by day. They met at U. of Budapest in native Hungary.



For pictures  
 of their  
 tense but  
 rewarding  
 work in  
 cancer  
 research,  
 turn page.



Drs. Julian and Clara make a joint examination of a patient suffering from cancer of the spleen. At Roswell Park there are more than 300 specially selected cancer patients whose illnesses are in some way related to research work going on at the Institute.

Dr. Julian (left) discusses research findings with some of his assistants. He is the principal cancer research scientist at Roswell Park. His most devoted assistant, wife Clara, (second from right) listens intently to her husband's explanation.





Under the watchful eye of her husband, Dr. Clara performs delicate experimental surgery on a laboratory animal. Such surgery has become part of her daily routine at Roswell Park.









A variety of laboratory animals play vital roles in today's cancer research. Among the most important is the monkey, for its reactions to the disease closely parallel man's.



Radiation therapy holds some hope for cancer sufferers, but radiation sickness can result from too massive a dose. The Drs. Ambrus (above) test a radiation therapy machine on a rhesus monkey. At a critical moment in surgery (left), tension lines Dr. Clara's forehead.

The hunt for a cancer cure is a tryingly complex one. The Drs. Ambrus' research into leukemia, or cancer of the blood, led to discoveries about the clot-dissolving substance plasmin. Now this substance is being tested on victims of coronary thrombosis. If it proves effective, it will be a life-saving by-product of cancer research.

Dr. Julian does not envision a single dramatic breakthrough that

will suddenly wipe out the dread menace of cancer. "Cancer is probably a hundred different diseases," he says. And he doubts if a single cure will ever be found. But, bit by bit, the killer can be pushed back. Though drugs seem to offer the best hope, he adds, radiation and surgery will continue to be important. His wife agrees. She usually does, she readily admits, "because he is right most of the time."

## Inventor of the month

# The cup that orders its own coffee



Luther G. Simjian has 132 U.S. patents to his credit. The Science Digest Inventor of the Month is also president of Reflectone Electronics, and is on the board of Universal Match Corp.

SCIENCE DIGEST's Inventor of the Month has received his 132nd U.S. patent—for a cup that can order its own coffee. He is Luther G. Simjian, president of Reflectone Electronics, Inc., at Stamford, Conn.

The patron of the usual vending system puts in a coin, gets his change, if any, and sees a cup settle under a spout. This process takes about 10 seconds. Then another 10 seconds is consumed in the pouring of the coffee, cola drink or fruit concoction, and its removal from the machine.

The long lines that form during lunch hour or coffee break at the automated cafeterias of industrial plants can be considerably shortened, Mr. Simjian believes, if the two vending processes are divided.

His cup (Patent 3,103,960) has a "designator" in its bottom, good for one filling. The customer pays his dime for an empty cup, and when he wants his drink stands briefly before one of a bank of spouts at another machine. This equipment, which does the pouring, senses the "designator," pours the proper drink, then destroys

the "designator," so the patron can't get seconds.

The self-ordering cup, in one mechanical form, has a tip that is felt by a "finger" on the vending machine, and is then broken off. An electric eye, in another embodiment, recognizes a spot of the proper color. The hot coffee changes the shade.

The patented container is not yet on the market, but Reflectone sees no great problem in putting it into production. The company's main business is building large electronic simulators used by the Strategic Air Command and the Navy for training.

In 1941, Luther Simjian invented a trainer for teaching pilots and gunners airplane recognition and range estimation. During World War II, a large number were produced by Reflectone, and military sources have told the inventor that they saved the lives of several thousand American and British aviators.

Before the war, he had invented and sold photographic devices, including the Photoreflex cameras that are still used in many department

store studios across the country.

Reflectone is now a subsidiary of Universal Match Corporation, a diversified company that is a large manufacturer of vending machines. Luther Simjian's versatility is illustrated by his invention of the Banko-

graph, Universal's automatic bank depositing machine, which is now undergoing trial operation in New York and other cities. In addition, he is on the parent company's board of directors.

—Stacy V. Jones



INVENTIONS  
PATENTS  
PROCESSES

## Super robot boat

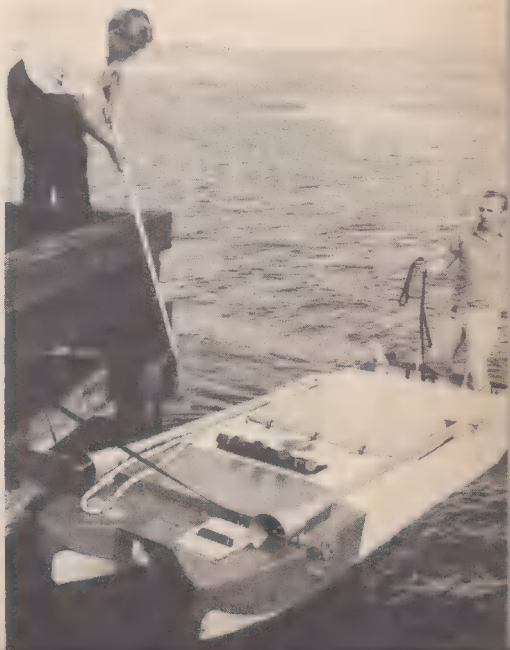
A ROBOT boat which can be parachuted from a plane to pick up a floating object lost at sea has been developed for the Air Force by Cook Electric Company's Technological Center Division, Morton Grove, Ill.

The small electric-motored boat has radio controls and specially-designed equipment for snaring the object to be recovered. The aircraft is equipped with air-snatch hooks and winch.

Once the floating object is located, the boat is dropped from the aircraft by an extraction chute, then lowered to the water by a main chute. The main chute is jettisoned

automatically when the boat is afloat. An electric motor propels the

This boat doesn't carry passengers—it doesn't have to. Following directions from a circling aircraft, it is designed to pick up objects floating at sea and pass them up to the plane. ▶



boat toward its target, under radio control from the circling aircraft.

When the boat reaches the object, a snare line is fired over it, and the object is then hauled toward the boat.

The boat then fires a capture net over the target with a five-barreled mortar. The mortar slugs act as sinkers to drape the net over the target. The boat backs off, closing the net by drawstring. A spring and gas pressure erect a pickup mast, topped by a hook, in the boat. The recovery net line is held to the mast by breakaway links.

Then the aircraft lowers a trapeze pickup gear and flies low over the boat to engage the hook. Once it has made contact with the hook, the plane climbs, pulling up the net line and recovery object, and winching them into the plane.

### **Golfer's delight**

For the golfer who has had a hard day on the course, Marvic Corp., 861 Manhattan Ave., Brooklyn, N.Y., has introduced a 19th Hole "Golf Ball" Ice Ball Tray, which produces ice "cubes" in the shape of golf balls for drinks or ice tea. The trays come packed with real high-velocity, distance-type golf balls, made to USGA specifications, which the golfer can whack around the course while the ice forms in the molds they occupied.

The polyethylene trays come in two sizes. No. GB 6 is 4" by 6" by 2¼" high and contains six golf balls. No. GB 12 contains 12 golf



Two products in one, the "19th hole" is a container filled with golf balls which becomes a novelty ice tray.

balls and is 6" by 8" by 2¼". They come in gift mailing boxes and have a snap-in display card which can also double as a gift card.

### **Snowbound? Ride an Ice Cycle**

Vehicles on "skis" are the answer to mechanized snow and ice travel offered by the Fox Company, Box 797, Janesville, Wis. Six new models have been designed for winter transportation.

The three-runnered Ice Cycle "130," intended primarily as an over-the-ice vehicle, is powered by a 3 hp gasoline engine. It cruises at 15 mph and is powerful enough to push its way through nearly five inches of heavy snow or slush. It can pull three skaters or skiers, or a toboggan, and is said to offer the same kind of control a sports car does. Its companion model, the Sno-Trac "140," offers more power but has a lower cruising speed. Almost 8 square feet of drive track help it to perform in as much as 20 feet of powder snow.

In the medium range Sno-Trac series, the "360" and the "380"



have heavy-duty engines and drive units. Both models have a drive-track area of nearly 14 square feet. The units themselves are less than three feet wide and nine feet long, including the skis. The commercial grade "510" and "520" models have 28 square feet of drive track, allowing the units to travel up to 25 mph under most snow conditions. They are just under four feet wide and span eleven feet, tip to tip. The "300" and "500" series models use a helical gear-transmission design and variable-speed, belt-drive automatic torque converter. Fox engineers claim this type of drive train is particularly compact, simple and dependable. It provides a forward, reverse, and neutral selection and picks up load smoothly.

The company expects the winter vehicles to have wide use at resorts and among sportsmen and outdoor enthusiasts who can use them for everything from hunting and fishing to trail rides and excursions. They may also prove useful to farmers in getting food to stranded cattle, for plowing driveways, and for hauling by lumbermen, utility companies, or airfield crews.

### **Pocket-size skate sharpener**

Half a dozen strokes along a skate blade with its pocket-size Skate Sharpener are all that is needed to sharpen a dull skate, says G.E. The sharpener need only be adjusted to the size of the skate. It has a cutting blade of Carboloy tungsten carbide and will outlast a



G.E.'s ice-skate sharpener is made of tungsten carbide and is said to outlast the average pair of skates.

pair of skates. It can be ordered by writing Skate Sharpener, c/o General Electric Supply Co., Dept. P, Post Office Box #5021, Bridgeport, Conn.



### **This oven cleans itself**

A solution to the problem of cleaning the oven, long a housewife's dirtiest job, has been offered by General Electric, Appliance Park, Louisville 1, Ky. G.E.'s P-7 Self-Cleaning Oven does the job with electricity. It's just a matter of setting three dials and shutting and

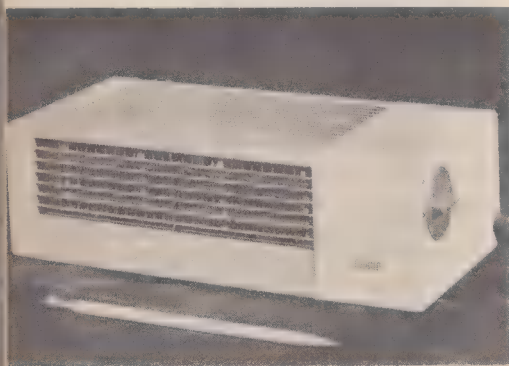
latching the oven door, according to the manufacturer.

The cleaning feature is controlled by an automatic time cycle. It is set to the time estimated necessary for the cleaning job, and it shuts itself off automatically when the time is up. There is little or no residue left in the oven at the end of the processes. A heavily soiled oven may leave a bit of ash at the end of the cycle—about as much as one gets from the flick of a cigarette—which can be removed with a paper towel.

### **Brick-sized room heater**

A new heater-ventilator can raise the temperature in a 12' by 18' room 10° in 36 minutes, yet is only slightly larger than a brick. It has been placed on the market by Thomas Edlyn Co., Dept. 87, P.O. Box 362, Collingdale, Penna.

The Thermo-blower, a compact room heater and air circulator, can raise the temperature of a room 10° in a little over half an hour.



A built-in thermostat keeps the room at any temperature desired from 50° to 85°.

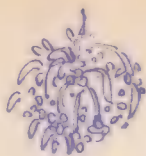
The Thermo-Blower, as the new product is called, gives three-step heating and air-circulation with its impeller cylinder blower. It may be placed on a desk, hung on the wall, or tilted at any angle to radiate in any direction. According to the manufacturer, it is quiet-running enough to be used in a nursery. It can be plugged into any AC outlet and weighs only five pounds.

### **Custom-built patio walls**

Custom-sized enclosure components for the homeowner who wants to screen off a porch, breezeway or patio, are offered by the Hess Manufacturing Co., Quincy, Penna. The company offers interchangeable components which can be mixed or matched in a variety of ways. Custom-cut components are supplied according to the customer's specifications. They need only be assembled.

Available in the Quincy Armaclad Enclosure System are: aluminum doors; screen-and-sash-wall, jalousie-wall, awning-wall, and solidwall sections; and self-contained roof panels. The components come in a variety of interior and exterior finishes. They are made of panels with rigidized Novoply core, a three-ply board of resin-coated plastic-impregnated flakes. Aluminum skins are bonded to the core under pressure. The enclosures are resistant to damage or denting.

# The



# magic

# of

# mistletoe

by Winifred H. Scheib

Today, this curious Cupid  
of the plant world  
cures kisslessness.  
It used to cure ■ lot more.

IT's almost time to hang up the mistletoe. It will probably bring you an extra kiss or two, but our ancestors expected much more from this strange plant.

Picture a childless woman from one of the tribes that inhabited Britain, northern France and Germany in pre-Christian times. She implores a priest, "All this time I have gone without a child. Give me a remedy which will help me bear a son for my husband."

"Take this sprig of mistletoe," the priest tells her solemnly. "Carry it upon your person day and night. Soon you will conceive."

In due time, the woman has a child. The husband, happy in his fatherhood, thinks about his herd. The cattle are not multiplying as they should. If mistletoe has brought fertility to his wife, perhaps it will remedy the barrenness of his livestock. He too consults the priest.

"Steep the mistletoe leaves until you have made a potion," the priest tells him. "Sprinkle this liquid upon the hay, and soon you will see your herd increasing."



Mistletoe's magic seems to have helped this family. But, alas, their newborn son is afflicted. He has the "falling sickness." At times, he is seized by terrible convulsions, leaving him spent and exhausted when they have passed.

Could this disease, which we know as epilepsy, be cured by mistletoe? The ancients thought so. Some suggested that a bag containing a sprig of the plant be tied around the child's neck. If the condition persisted into later life, he could ward off attacks by carrying a knife with a mistletoe handle.

There was no end to the things the ancients thought mistletoe could do. In France, it was used as an antidote to poisons. Holstein peasants considered it a sure charm for success in hunting. In Scandinavian countries, mistletoe was supposed to protect the household from fire, especially fire caused by lightning. You could even find where gold was buried beneath the earth if you had a divining rod of mistletoe wood.

### Reputation for magic

How is it that this simple plant came to have such a reputation for magic? Mistletoe, after all, is an unostentatious parasite which attaches itself to the limbs of many species of tree, usually planted there by birds who eat the berries.

The mistletoe berries are covered by a sticky substance, and birds, trying to rub off the covering with their beaks or claws, succeed in-

stead in forcing the seeds into crevices of the host tree. There, they promptly send out suckers to obtain life-giving moisture. Although the mistletoe plant can make its own food by means of its fleshy, gray-green leaves, it depends upon its host for vital minerals and water.

### Immune to troubles?

It was probably this semi-parasitic nature of the plant which made our forbears believe it had unusual properties. Other plants had roots, while mistletoe seemed to be growing rootless, high above the ground. Since our troubles seem to spring from the earth on which we live, would not the mistletoe, existing without any visible connection with the ground, be immune from these troubles? And when its host tree lost its leaves and stood apparently lifeless, would not the mistletoe, still green and flourishing, seem to have magical powers?

Today almost no one believes that the mistletoe can have the properties the ancients thought it had.

Although a drug derived from mistletoe, known as Protoveratrine, was used as late as 1952 to reduce blood pressure, most modern medical authorities are inclined to feel that mistletoe's magic is pure superstition.

There are those, too, who not only would not try to cure anything with mistletoe, but consider it dangerous. Walter C. Muenscher, in his book, *Poisonous Plants of the United States*, (MacMillan, 1961)



says several deaths among children were attributed to their eating of mistletoe berries. Also, he mentions "negative results" when the plant is fed to cattle.

Whether mistletoe is a help or a hazard, there is not much doubt that it can be a nuisance. This plant family includes 21 genera and over 600 species, and is quite widespread. Its scientific name combines the words "thief" and "tree," and it is truly a tree-thief. Unless its growth is unusually abundant, it does not kill, but it weakens a host tree by depriving it of nutrients and water, especially in arid regions.

The dwarf Western variety, *arceuthobium*, has done more damage to coniferous forests than any disease. This variety has an explosive seed which can be shot out of its casing for a distance of sixty feet, and there is no known chemical which is effective in controlling it.

In these times of scientific advancement, the lowly mistletoe has lost its magic. The only ailment it has been proven to cure is kisslessness. Yet, as we decorate our homes for Christmas, we accept it as a symbol of Yuletide good will. And who is to say that this, in itself, is not a bit magical?



### *A walking Rosetta Stone*

**P**RESIDENT Dori of the Niger Republic had journeyed over 2,000 miles from his capital on the west coast of Africa to Cairo. With him, making his first visit to Egypt, was the Nigerian Minister for Saharan Affairs, Moudaur Zakara. Soon after they arrived, they were taken on a traditional tour of Egyptian antiquities. As they passed a 3,000-year old sarcophagus covered by hieroglyphics, Zakar stopped and began reading by sight.

Egyptian archeologists were astonished. Egyptians today write and speak Arabic. They forgot hieroglyphics centuries ago, and the meaning of hieroglyphics became one of the great archeological mysteries. The key was found in 1799 on the Rosetta Stone, which had a hieroglyphic translation of a Greek inscription carved on its face. Even then, it took until 1822 for Thomas Young and Jean Champollion to puzzle out the signs.

Zakara explained that the characters are similar to those used by his own Touareg tribe. Why? Well, about 260,000 white Touaregs wander over the central and southern Sahara. Some 150,000 of these live in the Niger Republic, along with 2,850,000 Negroes. But the history of the Touaregs is unknown. The origin of their Tiffinagh alphabet is also unknown, although their language is similar to that of other North Africans. Today, they subsist by raising goats, sheep and camels along the fringes of the desert. In the past, they were also fierce warriors who raided Negro villages on camel-back.

Zakara's feat has prompted speculation that the Egyptian culture spread farther into the heart of Africa than is generally thought, or that modern Touaregs are the descendants of Egyptian migrants from the Nile Valley.

# the lying stones



**I**N May of 1725, Dr. Johann Bartholomew Adam Beringer, a physician and a learned dabbler in other sciences, was given some remarkable stones. They had been "dug up" on a hill near Würzburg, Germany. One bore the figure of the sun and its rays, the others had the likenesses of worms.

In the following months, Beringer discovered a multitude of such "figured stones" on the hill.

Although Beringer could not exactly account for the origin of these stones, he was sure of one thing—they were formed by natural causes.

Yet there were so many found that they seemed too good to be true—and indeed they were. The stones were part of an elaborate hoax conceived by two of Beringer's Iago-like colleagues: J. Ignatz Roderick, Professor of Geography, Algebra, and Analysis at the University of Würzburg, and the Honorable Georg von Eckhart, Privy Councillor and Librarian to the court and the university.

After a while, though, the scheme got out of hand. Beringer prepared

to publish a book about his "finds." The conspirators feared that publication might ruin them as well. They began to hint that the stones were fraudulent. But they had not counted on Beringer's tenacity. He published anyway and in his work discounted suggestions that all of his wonderful stones could have been false.

But Beringer was finally convinced of the hoax, according to one story, after he found his own name inscribed on one of the stones.

The story of the hapless doctor is revived in a newly translated and annotated version of his original work by Melvin E. Jahn and Daniel J. Woolfe, *The Lying Stones of Dr. Johann Bartholomew Adam Beringer* (University of California Press, Berkeley and Los Angeles, \$6.50).

A modern examination of the story shows that Beringer was not quite the fool one might at first imagine. His book, in fact, is valuable for modern historians of science, for it methodically lists all that passed for known in the field of paleontology at that time. *D. C.*



# the progress of MEDICINE

by Arthur J. Snider

## Drug-of-the-month club

DOCTORS are frequently being urged to prescribe the "latest drug out," about which they may know little or nothing, because a patient chanced to hear about it at a bridge game.

The radio, newspapers and magazines are other sources the layman draws upon to demand the drug that "everyone else is using."



In urging physicians to withstand these appeals, Dr. Harry F. Dowling, head of the department of internal medicine, University of Illinois, says in the *Journal of the American Medical Association*:

"Our frenetic society has had its influence on the physician. If automobiles and television sets must be this year's model, if two-button suits

are 'in' tomorrow and three-button suits went 'out' yesterday, then perhaps medicine becomes out-dated as easily.

"Thus, there is a tendency for physicians to think that the latest is the best and that failure to use a new drug will stamp them as being irrevocably behind the times."

To be "the first by whom the new is tried" may bring momentary satisfaction, but it will hardly win lasting respect from the medical profession, Dr. Dowling cautions.

He concedes that temptations to use a particular drug are great after it has been given a big buildup in medical journal advertising and by pharmaceutical representatives. But he adds:

"The rational physician decides to treat his patient on the basis of the disease the patient has, its pathophysiology, its natural history and the drugs that will combat the disease and how they work.

"He learns all he can about the absorption, metabolism, excretion of

the therapeutic agent he uses. In those cases in which he does not fully understand the mechanism of the drug's action, nor how effective it has been when used in similar cases treated by others, the wise doctor seeks the advice of experts, either through consultation or by reading what they recommend."

A doctor should never abdicate the responsibility for prescribing drugs, said Dr. Dowling, who is chairman of the AMA's council on drugs.

"The confidence that our patients place in us," he said, "is a tribute to our profession, but it should, in turn, make us all the more zealous to protect their interest."

### **Cigarettes find a defender**

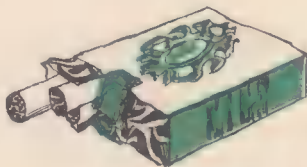
"Not proved."

That is the conclusion reached by Dr. Ian MacDonald, Los Angeles cancer specialist, after seven years of the study of evidence purporting to link cancer to cigarette smoking.

While calculations by U.S. Public Health Service biometricians show that in samples of 100,000 men there is more risk with increasing numbers of cigarettes smoked a day, reverse English can be applied to the data to show that in the great majority of regular cigarette smokers, the disease does not occur, Dr. MacDonald notes.

Not only is he unimpressed by the statistical data on a national basis but also on the regional level. For example, the sale of cigarettes per capita in Idaho and the State of

New York are nearly identical but the death rate from lung cancer is four times greater in New York. And there are variations within the same states. If the overall mortality rate in the U.S. is expressed as 100, Manhattan has a rate of 144 and Albany, 90. In Kansas, Wichita has a rate of 81 and Kansas City, 112. Charlotte, N.C., in the heart of the tobacco-producing country, has one of the lowest attack rates in the United States.



Most disturbing to Dr. MacDonald is what he believes are efforts to put cigarette smoking into the category of Volstead prohibitionism. He notes that a former president of the American Cancer Society advocated that staff members of the organization be instructed not to smoke "in public." Physicians, he adds, are being directed to drop smoking as an example to their patients.

"Even if one assumes that tobacco may contribute to the origin of lung cancer, its influence is weak indeed, providing no justification for the determined attempt to alter the habits of adults who tolerate the fragrant weed without evident sensitivity," Dr. MacDonald writes in a publication of the American College of Surgeons.



"For many smokers, their addiction is far less hazardous than the alternative, almost inevitable, peril of obesity. If, as Dr. Raymond Pearl suggested 30 years ago, the regular use of tobacco may decrease longevity by something over two years, many are quite willing to pay such a price in return for the continued enjoyment of the oldest, and surely the safest, tranquilizer of all."

### The making of a spaceman

Man is two inches taller than his forbears. He's losing his little toe and his wisdom teeth. His hair is disappearing over the body. The skin is changing to provide the protection hair once did.

In South America, Indians are able to work at heavy labor where oxygen level is markedly reduced. Lamas in Tibet can maintain normal skin temperature in subzero cold. Eskimos have adapted to high fat diets.



A person who unfortunately loses his sight will frequently find one of his other senses strengthened. A person who loses a lung often will develop a larger second lung to carry the added burden.

Two dozen or more people are

living with other people's kidneys. Livers and lungs are being transplanted.

The question is not "Can man be modified?" He is being modified, says Dr. Toby Freedman, head of life sciences at North American Aviation Corp., Downey, Cal. The question is: "Shall this modification be accelerated for man's survival in space?"

Up to now, Dr. Freedman says, we have been modifying the ship that carries the man to space. But the day is coming when the engineers won't be able to supply the needs of man.

Dr. Freedman believes life scientists should begin thinking about the problem from the other end. Instead of modifying the ship, modify the man. He doesn't mean adding electronic gadgetry to enhance his vision, sharpen his sensing qualities, augment his brain power or transistorize his organs. If this direction is pursued, future man will wind up a dehumanized individual with collapsed lungs and emotional feelings dissected out.

What Dr. Freedman wants to see is the development of man's own biologic potential so that he will have the oxygen requirements of a Himalayan sherpa, the heat-resistance of a walker-on-coals, and the appetite of a hermit.

### The myth of the fat singer

It isn't true that some degree of obesity is essential for a strong singing voice, says the American Medi-

cal Association. Obesity is as objectionable in singers as in any other person. From a physiological viewpoint, obesity may even disturb good singing technique because it interferes with the powerful movements of abdominal respiration that are essential to maintaining proper "breath support."



The popular belief among certain singers that some obesity may be desirable stems from the fact that dramatic singing voices are associated with strong body structure, says Dr. Godfrey E. Arnold of New York, an AMA consultant. Singers of heroic roles are usually tall and have athletic type bodies. The lyric tenor often is of shorter stature and more stocky. By contrast, coloratura sopranos and light lyric sopranos often have the slender figures of film stars.

### New look for the winter

A new medical device may make you look like a train robber, a surgeon or an Arab woman, but it will help some people breathe.

A Chicago physician, Dr. Louis Terman, has developed a warming face mask that preheats cold air for those who find that inhaling cold air causes discomfort.

This often is true of victims of asthma, bronchitis, sinusitis, emphysema, angina and other respiratory and heart disturbances.

The porous mask is worn over the nose and mouth. A small pocket situated between the nose and mouth holds a removable heating element. A rechargeable battery worn in the patient's pocket or dress supplies the energy to warm the air to a comfortable temperature.

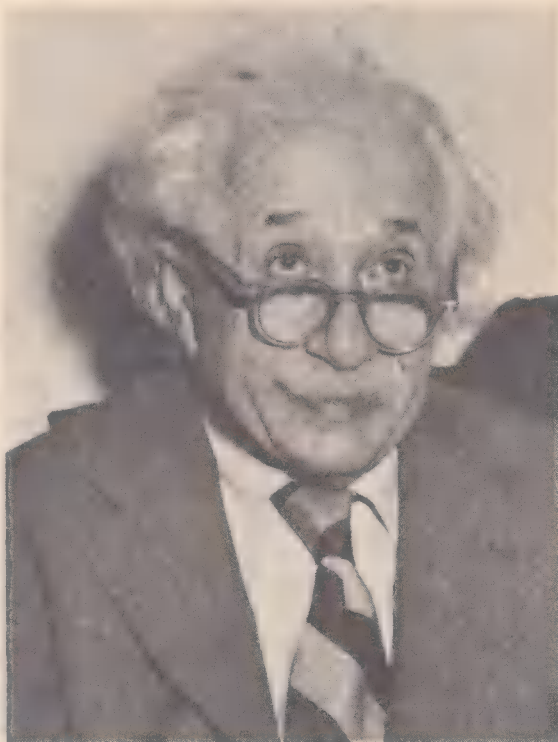
Dr. Terman has tried the mask for two winters on about 1,000 patients. A summary of results with 29 patients, 24 males and 5 females, is reported in the *Illinois Medical Journal*. The age range was eight years to 75.

Some were so sensitive to cold, they were incapacitated to the point where everyday activities had to be curtailed or stopped, Dr. Terman said. One was an asthmatic child who had not been able to attend school in the winter. Another was a retired Army colonel who kept careful records and found he was incurring distress when the temperature dropped to 35 degrees. Last winter, with the face mask, he was able to walk ten miles in a temperature of 10 below zero.

"The exact mechanism responsible for the changes that take place because of cold air inhalation is not yet fully understood," said Dr. Terman.

There is some evidence that histamine, a natural body chemical, is released in free form upon exposure to cold.

## Einstein was right



KFS

By using small particles and high speeds  
scientists have proved that  
186,000 plus or minus 90,000  
still equals 186,000.

**T**HE atomic reactor in Rehovoth, Israel, was the scene recently of an elegant experiment which put to rest questions about Einstein's second postulate of his Special Theory of Relativity. This basic law of physics states that the speed of

light is constant and independent of the motion of its source.

New studies by several scientists suggested that the law might need revision; that the speed of light did vary with the movement of its source. Here physicist Dror Sadeh of the Israel Atomic Energy Commission intervened. The problem might be stated something like this:

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A car is traveling at night at a speed of 60 mph. The question is, what is the speed of the light being emitted by the headlights and the taillights? Einstein's law says that the speed of light is always the same: it is always 186,000 miles per second.

No, the new evidence seemed to argue. The light from the headlight travels at the speed of light plus the speed of the car; light from the taillight moves with the velocity of light minus the speed of the car.

### A test situation

Dr. Sadeh used the facilities of the Rehovoth reactor to set up a test situation. What he did was to select a moving source of light whose own speed, unlike an automobile's, could be meaningfully measured against the speed of light. Dr. Sadeh set a positron (a positively charged electron) in motion at a speed of roughly 90,000 miles a second. The laws of nuclear physics now went to work on behalf of Dr. Sadeh's experimental design.

He knew that when a positron collides with an electron, the two particles destroy one another, producing gamma rays. Gamma rays are actually a form of light, and their waves travel with its speed. He also knew that the impact would launch some gamma rays on a path in the direction of the positron's flight, but others along an opposite path. The remaining problem was to monitor the sequence of events

accurately, both the speed of the gamma rays and the direction of their movement.

So the collision was arranged. The gamma rays liberated by the annihilated positron sped along their predicted paths, either following or reversing the positron's course. The extremely sensitive monitoring equipment used had no difficulty in determining whether or not the gamma rays traveled at speeds plus or minus 90,000 miles per second. Their speeds, within the experimental margin of error, were shown to be identical. That is, the speed of light is constant and independent of the motion of its source.

How did Dr. Sadeh know that the gamma rays came from a positron destroyed in flight and not at rest? He knew that gamma rays move away from a positron destroyed at rest always in the same straight line. He positioned his equipment accordingly, so that it would pick up only those gamma rays whose paths made an angle with each other of less than  $180^\circ$ . These would have to be rays, then, resulting from a positron annihilated in flight.

The arrival times of the gamma rays were recorded at the ends of their respective paths by photomultiplier tubes which convert light impulses into electrical energy. The information was then transmitted to a coincidence counter which determines whether or not the impulses are detected within a given interval of time. This was how it was shown finally that the gamma rays had identical speeds.



## A new approach to sex



A GROUP of college educators have spent a couple of weeks educating themselves about the facts of life on the campus.

Impelled by growing parental concern about sexual freedom among young people, a two-week conference on sex was sponsored by the Department of Guidance and Student Personnel Administration of Teachers College, Columbia University, and the National Association of Women Deans and Counselors this summer.



The conferees concluded that the subject of sex must be discussed openly and frankly on college campuses rather than being kept a forbidden topic mentioned secretly, thus creating fears and perpetuating misunderstandings.

Most important, they felt they must encourage young people to reject the "destructive use of sex."

They emphasized the need for a "new morality," that is, a new ethical approach toward sex that would advise against sexual license not merely because it was "morally bad," but also because it was destructive to human relationships. They hoped that convincing young people of the dignity of the individual would discourage sexual license.

Participants in the conference explored the differences in attitude toward sex of boys and girls. Some boys, they felt, are impelled "to make out with a girl" to impress their friends, but that thereafter hold little respect for the girl.

Girls, it was suggested, tend to engage in premarital sexual intercourse only after they have developed romantic attachments to a boy.

Boys, they said, when desiring sexual intercourse with a girl, should not only consider the possible consequences of such an action, but also think of her as a human being, not as a source of mere gratification.

In the case of a young woman who believes that the quickest way to marriage is getting pregnant, it was suggested that she might consider the heavy burdens she would place

on a boy trying to complete his education.

The conference also brought out a belief that reports of extensive premarital sexual intercourse in colleges have been exaggerated, although not all the participants agreed on this point.

### Speech began with hunting

Hunters were probably history's first talkers, too, says anthropologist Ashley Montagu.

Writing in *The Journal of the American Medical Assn.*, Dr. Montagu states, "In running, and the excitement of the chase, there would be a strong tendency toward violent expression of air, which could readily be converted into a meaningful cry or yell. All that is necessary is the repetition and imitation of such sounds in similar contextual situations for them to become established as words. In this manner a simple vocabulary would come into being, which could then serve as a basis for further development."



Speech, or language, Dr. Montagu said, formally comes into being when two or more individuals agree to attach the same meaning to the same sounds and thereafter use these sounds consistently with the mean-

ings that have been conferred upon them.

When man was merely a small game collector content with the simple stalking of game, speech was less necessary because in stalking prey it is essential to be quiet, Dr. Montagu said.

When the earliest progenitors of man were forced to take to a hunting way of life, owing to the deforestation of formerly thickly forested areas, he said, a high premium would have been placed upon the ability to communicate by sound with fellow hunters. This would be especially true during the chase, when it would be highly desirable to communicate changing intentions paralleling the changing conditions during the hunt, he said. This would require signaling of modified strategies, and this could best be done by voice.

### Fear upsets 'atomic medicine'

A patient's fear can throw complicated, nuclear-driven medical equipment into registering misleading information, cautions a team of doctors from Duke University Medical Center.

Their conclusions came from a study of 21 high blood pressure patients, each of whom was having an analysis made of kidney-function through injection of radioactive iodine.

The doctors studied two renograms, the medical term for the charted journey of the radioactive material toward the kidney, from

each patient. In the second, the patient's apprehension was often dissipated.

The doctors concluded that in some patients the emotional stress of the first test affected the patient's kidney function and made the renogram appear as if it was functioning more normally.

### **Just as smart at 50**

Brain power does not diminish with age up to 50 and it does not necessarily decrease after that.

This conclusion is based on 10,000 persons who have taken a battery of neuropsychological tests designed to evaluate their brain power or how much brain power they are using. The ten tests measure a person's memory, judgment, perception, and power.

The examining method was developed by Ward C. Halstead, Ph.D., professor of experimental psychology, department of medicine and psychology, University of Chicago.

Dr. Halstead said the tests have shown that the brain power of 78 percent of top-level executives tested, averaging 50 years of age, is comparable to that of medical students 25 years younger on the average. In other words, he said the brain does not appear to age or deteriorate just through the passing of time up to the age of 50.

Although the tests indicated that signs of impaired brain power were more frequent in the sixth and seventh decades of life, Dr. Halstead

said, some executives in their 60's and 70's showed no impairment.



The battery of tests measures the fundamental functioning of the nervous system, visual acuity, abstract thinking, the subject's reaction to what he hears, the brain's ability to record and remember what the eyes see, and how well the individual is able to program his activities to fit his productive mental capacities. The tests are remarkably free from cultural influences such as education, economic background, skills, interests, experience, or the intelligence quotient, Dr. Halstead believes.

### **Trade in your appetite**

A pair of researchers have suggested that modern man may have to trade in his appetite for a new one.

In today's world, where foods are more concentrated and nutritious and workloads lighter, Dr. Neal Miller of Yale University and Dr. Eliot Stellar of the University of Pennsylvania believe that the appetite-controlling mechanism in man can and should be changed or controlled.

Dr. Miller says that work with laboratory rats showed that chemi-

cal and electrical stimulation of the brain regulated the food intake of the animals.

Of course, Dr. Stellar says, the scientists do not propose to put electrodes into man's brain to control his appetite, or to inject chemical substances there. Their object, he says, is to differentiate body mechanisms and processes or substances that control appetite. Then, the Pennsylvania researcher predicts, a pill may be devised to reset the appetite mechanism.

### Head bothering your feet?

Eight out of ten Americans have something wrong with the way they walk, says Dr. Jack T. Sanders, a podiatrist, or foot specialist, from California. Many of these problems are psychosomatic, he adds, and can be helped by hypnosis.

A good percentage of the problems are so minor that they pose no serious health question. Others are of structural nature and require surgery, bracing, casting or other medical procedures for correction.

But in many cases where the defective gait is functional, he observes, post-hypnotic suggestion can assist in restoring normal walking habits. Dr. Sanders emphasizes that the objectives of post-hypnotic suggestion are consistent with those outlined for conventional therapy and are accomplished through exercises carried out by the patient at the subconscious level.

Patients who would normally not accept the doctor's diagnosis or per-

form required exercises, he says, will do so as a result of post-hypnotic suggestion without being aware of either irritation or inconvenience.

### The hidden causes of killing

There are a number of ways to die which are generally believed to have psychosomatic origins—murder, suicide, alcoholism, high blood pressure and ulcers. Using United Nations statistics, Dr. Stanley A. Rudin, a Nova Scotia psychologist, compared cause and effect in four countries which have about the same living standards and technology.

He found that the five types of killing were due to two personality patterns: 1. the repressive, in which inhibitions of emotion produce ulcers and high blood pressure; 2. the aggressive or acting-out pattern, leading to murder, suicide and alcoholism.



#### His findings:

"Frustrate a Frenchman, he will drink himself to death; an Irishman, he will die of angry hypertension; a Dane, he will shoot himself; an American, he will shoot you, then establish a \$1 million program for your relatives. Then he will die of an ulcer."



# What you can do about WRINKLES

There is no quick,  
'miracle' way to get rid  
of facial wrinkles.  
But if you're careful  
you can help slow  
the skin-aging process.

A SEARCHING look in a mirror for signs of a new facial wrinkle is a daily habit for many women. Even young women are concerned by the appearance of superficial lines which can indicate the patterns that wrinkles will form as the skin ages. (A wrinkle is a crease or furrow in the skin caused by changes in the deeper skin layers.)

Skin aging—accompanied by wrinkles, folds, sagging, creases and furrows—is inevitable. Nevertheless, there are ways to prevent the rapid aging of skin. The aging process can be slowed somewhat by proper skin care and good health practices. However, do not confuse these practices with exaggerated claims of some products that they can “do away with” or “remove” wrinkles. To date, no valid medical

data have been supplied to support such claims.

Medical authorities, it should be emphasized, do not know all the reasons why aging takes place. They know that heredity is a factor. Sun exposure can cause aging—as evidenced by the weather-beaten faces of farmers and fishermen. Wrinkling can also be speeded by facial expressions, such as frowning, grimacing, squinting and even laughing or smiling.

In youth, the elasticity of the skin reshapes it into smooth contours after it has been stretched by a frown or a laugh. But as you grow older, the skin loses its elasticity. It also becomes thinner, drier and, in many cases, the fatty pads which support the skin disappear or are re-formed unevenly.

Consequently, as a muscle pulls the skin, wrinkles and furrows are formed which do not “iron out” as your expression relaxes. Folds and furrows form at the places of muscle stress. Dryness may produce fine surface lines. This, coupled with the deterioration in the sub-surface area, causes wrinkling and sagging.

These changes do not occur overnight. They involve a gradual change over the years. Therefore, the time to think about forestalling wrinkles is when you are young, although at almost any age you can take steps to keep from getting more heavily wrinkled. The main areas of concern in skin care are:

**SUNLIGHT.** Ultraviolet rays in sunlight cause skin to age. Doctors

**Enemies of your skin: excessive sun;  
dryness; frowns and squints;  
and inadequate sleep, exercise and food.**

believe this effect is cumulative—the more exposure, the older the skin becomes. Too, many doctors believe that skin cancer accompanies excessive exposure to the sun's rays. To keep these rays from burning your skin, wear protective clothing or use a sun-screen preparation. Ultraviolet rays are especially strong in midday, between 10 a.m. and 2 p.m. They also penetrate haze, so do not think you are protected on an overcast day. Those who want a year-round, deep tan should consider the risk of speeding the skin-aging process.

**SKIN DRYNESS.** The preservation of moisture in the skin helps to keep it firm and prevents fine surface lines from forming. Oil-based creams and other emollients with moisturizing ingredients help prevent evaporation and keep the skin soft. These may be either water-in-oil emulsions (oily creams) or oil-in-water emulsions (non-oily creams). Their effect is temporary, and they should be applied daily to be effective. In youth, the skin usually has an ample—or sometimes even an excess—supply of natural oil. Soap, which removes some oil, can be used frequently at younger ages without fear of drying the skin. As you get older, you should use less soap,

lighter massage and more cream to compensate for the decrease in production of natural skin oils.

**FACIAL EXPRESSIONS.** No one can go through life with a frozen, blank expression to avoid wrinkles. But you can check your habits to see whether you constantly frown when you concentrate on work, squint in bright light or wrinkle your nose in distaste. Repeated year after year, these expressions deepen facial wrinkle lines.

**HEALTH.** Because the skin is nourished by the blood stream and not from the surface, the condition of the skin can reflect general health. Adequate sleep, exercise and a well-balanced diet can help to maintain good physical condition. This forms a basis for a healthy skin.

**GOOD CARE OF THE SKIN** can delay the aging effects, but wrinkles, in spite of this care, may form faster on some faces than on others. This is due to an inherited tendency which doctors say cannot be changed. Additionally, lighter-skinned persons—especially those with red hair or blue eyes—have less natural protection against sunlight. Overexposure to the sun can

speed skin aging faster in such people than in darker-skinned persons whose skin pigmentation affords some built-in protection.

What can be done about wrinkles after they occur? Cosmetic preparations can minimize some effects of skin aging and slow others, but wrinkles cannot be wiped away. The Food and Drug Administration does not believe that creams, oils or lotions should be offered for preventing, correcting or removing wrinkles. However, an emollient which lubricates the skin may claim it aids in smoothing lines caused by skin dryness.

### Drug or cosmetic?

The FDA says a claim that a product can affect wrinkles involves a physiological change in body structure. This makes the product a drug—not a cosmetic—and the manufacturer must prove that a new drug is safe and effective for the purpose claimed in its labeling.

In recent years, there has been a tendency to add ingredients to cosmetics which make them drugs. These include hormone cosmetics which have small amounts of estrogen and/or progesterone (female sex hormones). There is some clinical data that shows hormone creams do cause a slight swelling of skin tissues—due to water retention—which may fill out the skin. However, this effect was not easy to see in half-face tests (the hormone product was used on one-half of a person's face and an ordinary prod-

uct on the other) made by a dermatologist in 1954 for the Good Housekeeping Institute. His report concluded: "Any visible changes that may result are small, slight and intangible."

Too, some medical authorities are concerned about the possible effect of long-term overuse of hormone creams. Joseph B. Jerome, Ph.D., secretary of the Committee on Cosmetics of the American Medical Association, says if too much of the same or too many different creams are applied too often over large skin areas, the hormone can be absorbed into the blood stream. "This," he says, "may cause a systemic effect." For this reason, the FDA limits the amount of hormone which can be used in these creams so that if directions are followed they should not cause any systemic reaction.

Other ingredients have been put in cosmetics and claimed to have "miracle" value in eliminating wrinkles. One of these is royal jelly, a substance fed to queen bees by the hive workers. Commissioner George P. Larrick, of the Food and Drug Administration, has said: "Royal jelly has no practical value for humans, either as a cosmetic, or a food, or a drug." Other substances such as animal and fish extracts, orchid pollen, turtle or mink oil and even certain spring waters have also been promoted as "miracle" ingredients without any proof that the products containing them are better than any good emollient.

The FDA, the Federal Trade Commission and the U.S. postal in-


spectors have acted against false claims made for products, including various machines, designed to remove wrinkles. In most cases, the producers of such "wrinkle removers" agreed to stop advertising them as wrinkle cures when confronted with the possibility of prosecution.

### Medical treatment

Various methods are used by doctors to remove blemishes and wrinkles. Dermatologists sometimes use chemosurgery to remove a layer of skin with a chemical. Even doctors

who use this technique require highly-specialized knowledge and skill. It is dangerous when used by non-medical people. Deep wrinkles can be removed by plastic surgery, but this treatment is expensive. Also, the effects are not permanent and wrinkles will gradually appear again, probably within five to ten years.

There are many good cosmetic products which beautify, keep skin soft and cover blemishes. Dr. Jerome, of the AMA, says these products not only are useful for skin care, but also meet a genuine psychological need.



### Old birth-control methods studied

Two old methods of birth control, the "male operation" and the "steel ring" have been revived and today are being discussed seriously.

The most controversial is the vasectomy, the male sterilization operation. The operation involves severing the *vasa deferentia*, the tubes which carry sperm from the testes to the seminal fluid. It is simple, cheap and can be performed in about 12 minutes with local anesthesia. The operation does not interfere with sexual potency; in fact, in some cases it has seemed to increase sexual desire. It is 100 percent effective and permanent. This is the drawback. Some surgeons have reported success in rejoining the vasa in men who later changed their minds, but such operations usually don't work.

Male sterilization remains an emotionally charged issue and the legal aspects are uncertain. Many feel that it will be the last method of birth control to gain general acceptance.

More promising are the simple, cheap birth-control devices that are modifications of a German invention of the 1920s. The earlier device was not used because of fear of infection and the lack of antibiotics to counter it. Today four new devices, one of steel and three others of plastic, have been successfully tested on 4,000 women in the U.S. and various Latin American countries. They are inserted into the uterus by a physician. Once they are in place, regular checks are all that's needed. No other birth-control substances are required. Tests have shown the devices to be 98 or 99 percent effective and safe, although in a small percentage of cases there were minor side effects such as cramps.



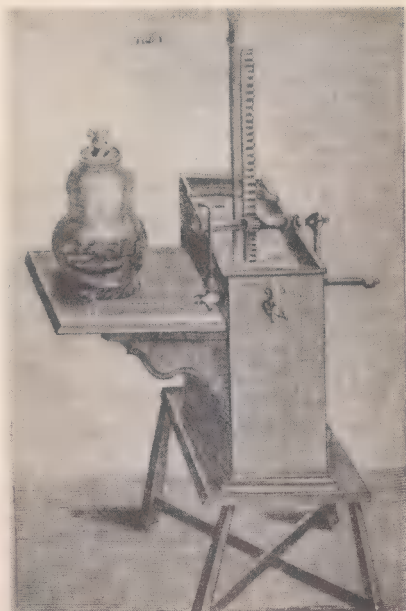
# YOUR SCIENCE ABC's

## Gases

### MOLECULES IN MOTION

**G**ASES are fluids which have their atoms and molecules much farther apart than are those in liquids and solids. They can expand or contract by very large amounts, and in this respect they are very different from liquid fluids and solids.

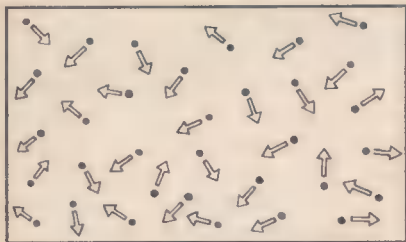
A number of laws have been discovered about the effects on gases of changes in pressure and temperature. One important discovery was made in 1660 by the English scientist, Robert Boyle. Boyle's law explains how the pressure and volume of a gas change when its temperature remains the same. He proved that if we wish to squeeze gas into half the space, we must double the pressure on it. The atmosphere obeys this law, for at the earth's surface the air pressure is 14 pounds per square inch because of the great weight of the air above. The pressure at the top of Mount Everest is only one-third of this or less than 5 pounds per square inch, and so the



English scientist Robert Boyle used this vacuum pump in 17th century experiments with pressures exerted by gases.

amount of air in 1 cubic foot at the top of this mountain is only one-third of that in a cubic foot at the earth's surface. This, of course, does not take changes in temperature into account.

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Ever-moving molecules in a gas.

In 1787 a French scientist named Charles discovered exactly how gases expand and contract when heated or cooled. He found that all gases expand by the same amount with every degree rise in temperature, if their pressure remains the same.

### Where motion ceases

Suppose that a gas is cooled; then it shrinks in volume. We might suppose from this that a gas would shrink to nothing if only it were made cold enough. In fact, at a temperature of  $273^{\circ}\text{C}$ . below freezing it would do so according to theory, but in actual fact gases usually turn into liquids before they reach this temperature, which is called "absolute zero." Heat is a measure of the motion of the molecules in a substance, and absolute zero is the temperature at which all motion ceases. Lord Kelvin first suggested calling it absolute zero, and since it is  $273^{\circ}$  below freezing on the Centigrade scale, it is clear that freezing point is  $273^{\circ}$  on the Kelvin, or Absolute, scale. Thus, freezing point can be written as either  $0^{\circ}\text{C}$  or  $273^{\circ}\text{K}$ .

The Kelvin, or Absolute, temperature is of the greatest importance in science, especially in atomic physics. We know that the Absolute temperature of a gas depends on how fast its molecules move and, in fact, we can work out the Absolute temperature if we know how fast they are moving. The opposite is also true, and if we know the Absolute temperature of a gas we can do a sum to find out how fast its molecules are moving.

Another remarkable fact has been found out about gases, and it is that when they occupy the same space, and are at the same temperature and pressure, they all contain the same number of molecules. This suggestion was first made by the Italian scientist Avogadro in 1811, and has since been proved true. It is known as Avogadro's Hypothesis. As with the Laws of Boyle and Charles, Avogadro's Hypothesis applies only to gases, for liquids and solids behave in an entirely different way.

### Both elements and compounds

Many thousands of different gases are known. Some of them, like hydrogen, oxygen and nitrogen, are chemical elements, but others, such as carbon dioxide, marsh gas and acetylene, are compounds made up of other substances. Animal life cannot exist without oxygen to breathe, and in a room containing only carbon dioxide or nitrogen we would soon suffocate, though they are not poisonous. The poisonous

gases include chlorine, ammonia and sulfur dioxide.

Most solid substances—but not all—melt when they are heated, and when their liquids are boiled they form vapors or gases. Similarly, when gases are cooled they first con-

dense to liquids and finally become solid.

Thus, liquid air is a mixture of oxygen and nitrogen which has been cooled until it condenses. This happens at about  $80^{\circ}\text{K}$  or  $140^{\circ}\text{C}$  below freezing.

## Geiger counter

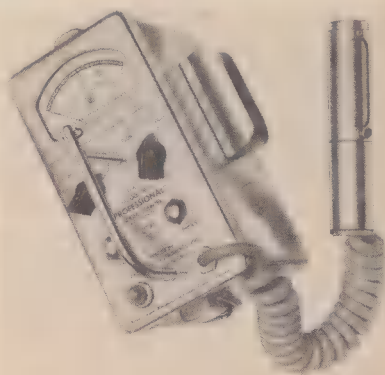
### HOW TO DETECT RADIOACTIVITY

THERE are several forms of Geiger-Muller counters (or "Geiger counters" as they are often called, for short). One common form consists of a thin metal cylinder with insulating plugs at each end. This tube or cylinder contains gas at a pressure much less than that of the air outside.

#### Anatomy of a Geiger counter

Through the center of the tube is a wire which is attached to the positive terminal of a battery giving from 500 to 1,000 volts. Another wire is connected from the thin metal tube to the negative of a battery. When the counter is not in use, an electric current will not flow across the gap between the positive wire in the middle to the metal walls of the tube, because the gas inside is an insulator and will not allow electric current to pass.

We know that a radioactive body gives out alpha, beta and gamma radiations. When such a body is brought near to a Geiger counter, its



A Geiger counter in its casing. Radiation entering the probe tube causes electric current to flow to the recorder.

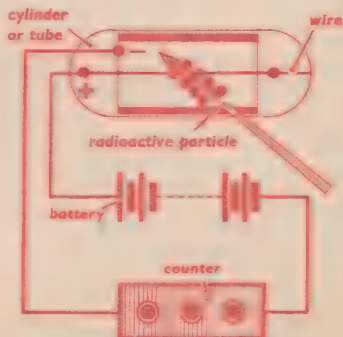


Diagram of a Geiger-Muller counter.

radioactive particles pass through the metal tube into the gas, where they knock electrons out of the gas atoms. This makes the gas a conductor of electricity and so an electric current flows. The wires from the Geiger counter lead to a recorder, so that the electric current registers itself as an audible "click."

### Counting the clicks

In a very short time, the electric current sweeps all the free electrons out of the way and the gas then becomes an insulator again and is ready to receive another particle from a radio-active source. The particles may arrive so quickly that we hear several clicks per second, and if we count them we can tell how radioactive is the substance being tested. The counter is often connected to a special instrument which automatically measures the strength



A prospector searches for uranium ore with a Geiger counter. He holds the probe, the recorder is carried at his hip.

of the radiation as well as counting the clicks and recording them. The Geiger counter is essential for studying radioactivity and is a key tool of the Atomic Age.



### *Darned clever, those flu bugs*

*I*F you have gone through the pain and trouble of getting a flu vaccination and now are wondering why you are down with a case of the flu, it's because the flu virus is a tricky little beggar who changes so fast that it has been impossible to perfect a really effective flu vaccine.

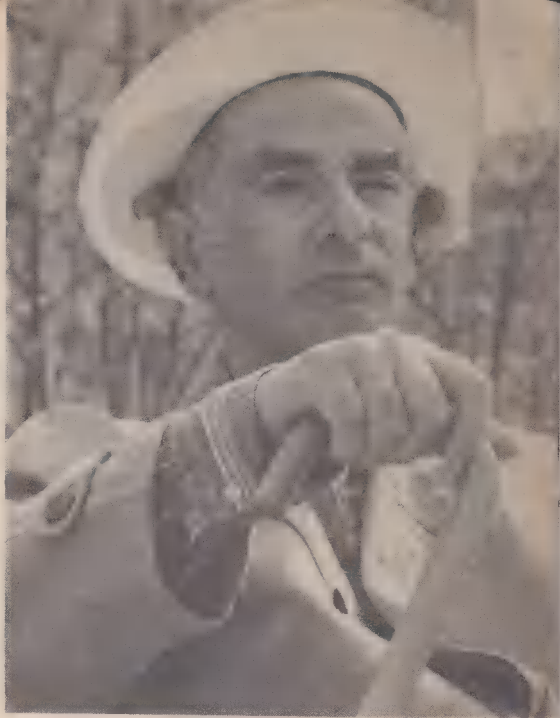
Dr. Alexander D. Langmuir, chief of the epidemiology branch of the U.S. Public Health Service's Communicable Disease Center in Atlanta, Ga., says that the 1962-63 influenza vaccine was only 25 to 50 percent effective in warding off flu. This was in the biggest epidemic winter since 1957, the year Asian flu was introduced to America. About 50,000 persons died in the U.S. last winter from flu and its complications.

A big problem in perfecting a flu vaccine is coping with the mutations or altering character of the flu virus, Dr. Langmuir said. There is evidence that last year's epidemic of Asian flu was caused by a mutant strain, he says. In other years, flu vaccines have been more effective, but effectiveness is unpredictable year by year.



Sovfoto

A car crash in the Russian winter severely injured and almost killed physicist Lev Landau shortly before he was to be named ■ Nobel prize winner.



**Few scientists in Russia have achieved so much so young as Lev Landau, while surviving a Stalinist pogrom against Jews and almost certain death in an auto crash.**

## Whiz kid of Soviet science

by Albert Parry

**L**EV Davidovich Landau, or "Dau" to his closest friends, was the fourth Russian scientist ever to win the Nobel prize in physics. But he could not travel to Stockholm to receive his honors from the committee and the king. The Soviet physicist, in fact, could barely move to the next room when the tidings reached him in November, 1962. "How sad," the Moscow *Literaturnaya Gazeta* commented, "that the news came to Landau in the hospital, and not at his desk, nor amidst the students' tumult of his lecture halls."

It was a miracle that he was alive at all—that he was at last conscious and able to understand the announcement; that he could even half-sit up in his bed, however briefly, and smile and raise his hand to Rolf R. Sohlman, the Swedish ambassador, who brought him the king's first congratulations.

Ten months before, Academician Landau had been given up for dead, and not just once, but four times. Each time, by a supreme effort of modern medical science, he was brought back to life but still not to consciousness. Each time, the doc-

tors thought that their success was temporary and useless.

On January 7, 1962, on the icy road leading to the famous atomic-research center of Dubna near Moscow, a car had swung to avoid an oncoming vehicle and collided with a truck. Landau, the car's passenger, was lifted from the wreck all but lifeless. His heartbeat and respiration were ebbing. His skull was fractured, and so were his ribs and pelvis.

### In deep shock

In the hospital, doctors found 11 bone breaks in addition to the skull fracture. They also found injuries to the heart, kidneys, and central nervous system. Landau was in deep shock.

Oxygen was administered. Blood transfusions were tried. An emergency operation was performed to lessen the pressure on his brain.

His heart stopped on the fourth day after the accident. Quick stimulants revived it. It stopped again on the seventh day, and once more on the ninth, and for the fourth time on the eleventh day. Stimulants each time pulled him back to life. But all these long and awful days, Landau remained unconscious, his temperature rising to 107 degrees.

Many of the world's foremost

neurosurgeons were rushed to Moscow, among them Canada's Dr. Wilder Penfield.

Landau was still unconscious when, late in February, his condition was judged to have improved sufficiently for him to be transferred to the Moscow Institute of Neurosurgery. One day soon afterward, his distinguished physicians met outside his room for one more consultation. Meanwhile, a physicist, Professor Yevgeni Lifshits, a close friend and collaborator of Landau, was in the sickroom. Landau's body was completely inert, but his eyes were open. Was he at last conscious? Professor Lifshits thought he would try:

"Dau, if you recognize me, close your eyes."

Landau closed his eyes. Lifshits rushed into the next room:

"He recognized me! Yes, he did!"

The real recovery, thus beginning, was slow. In the winter of 1962, a medical report from Moscow read:

"Physicians feel that Landau's intellect, his ability to think deeply and logically, have been restored. But his memory is still unreliable. One important positive factor, they feel, is that he himself now realizes his condition. He speaks of his wish to return to his favorite work—theoretical physics—but understands that he is not quite ready to work properly."

A mathematical problem of some complexity was gingerly tried out on Landau. There was dismay when the patient whispered what seemed

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Dr. Albert Parry heads the department of Russian Studies at Colgate University. He was born in Russia and came to the United States in 1921.



All photos Sovfoto

Official presentation of the Nobel prize by Ambassador Rolf R. Sohlman took place in December, 1962, when Landau was on the road to recovery.

Landau was given up for dead not once, but four times. Each time he was brought back to life by a supreme effort of medical science.



Attended by his wife, Cora, Academician Lev Landau was still bedridden in November, a full ten months after almost losing his life in an automobile accident.

Doctors from different corners of the earth pooled some of the most distinguished medical ability available to pull Landau through one crisis after another.



to be a wrong solution. But the dismay turned to jubilation when a colleague checked the answer once more—and discovered that it was right after all, that Landau had merely come to the correct conclusion in an entirely original way. Just like Landau!

He was judged to be strong enough for the official Nobel prize presentation on December 10, 1962, when Ambassador Sohlman returned to the sickroom along with such luminaries of Soviet science as Academicians Peter Kapitsa, Nicholas Semyonov, Igor Tamm, Mstislav Keldysh, and Lev Artsimovich.

### Kapitsa's summary

Semyonov and Tamm were themselves Nobel prize winners, in 1956 and 1958 respectively. Keldysh and Artsimovich came on behalf of the Soviet Academy of Sciences, the former as its president, the latter as its secretary. It was Kapitsa who indicated why so much had been done to save the ailing Landau.

Speaking of a quarter-century of association with Landau at the Academy's Institute of Problems of Physics, Kapitsa said:

"Landau has done work in all the fields of theoretical physics, and all of it can be described by one word—remarkable. We all love Landau very much. We are proud that his work has now been marked by this worldwide recognition. Seldom can you find another such man with such zest for life, so full of camaraderie, such a wonderful friend,

such an attentive teacher of young physicists."

Lev Landau was born on January 22, 1908, in the Caspian oil city of Baku, the son of a middle-class Jewish family. He was a prodigy in mathematics and other exact sciences even before he reached his teens.

He was 18 and a student at the University of Leningrad when he published his first independent theoretical work. For his subject, he chose quantum mechanics, then—in 1926—the very newest, least known, most difficult route into the as yet unexplored depths of the micro-world. Next year, at 19, he introduced into physics the concept of *matritsa plotnosti*, or matrix of density, now common in quantum mechanics and statistical physics. While he was still 19, Landau was graduated from Leningrad University.

Later, he got his doctorate. He worked for a time at the University of Kharkov in the Ukraine, but presently moved to Moscow. In 1937, he began his association with Kapitsa (see "The Russian Who Talks Back to Khrushchev," *Science Digest*, June, 1963) at the celebrated Institute of Problems of Physics. He is still at the Institute, as head of one of its departments. In 1943, he also became a professor at the University of Moscow.

He was elected a member of the Academy in 1946, when he was only 38, an unusually early age to reach that exalted rung of Soviet scientific honors. Most Russian professors





Sovfoto

Happier days, May 1961, found Lev Landau (right) at the side of another Nobelist, physicist Nils Bor, attending the traditional students' carnival at Lomonosov University.

become academicians in their late fifties or even in their sixties.

Landau had been a graduate of Lenin University only three years when he predicted diamagnetism of electrons; it is now called "Landau's Diamagnetism." In 1935, he did pioneer work in ferro-magnetism; in 1936-37, in phase transformation of solids. His research in the late 1930s was concerned chiefly with building and proving his theory of the intermediate stage of superconductivity.

In 1940-41, Landau developed the macroscopic theory of superfluidity of liquid helium at temperatures close to absolute zero, continuing Kapitsa's earlier achievement (1938) of discovering the phenomenon of helium superfluidity. The 1962 Nobel Prize was awarded to Landau for his bold experimentation with condensation,

and for his liquid-helium theory in particular.

In short, Landau has explored some of the fundamental phenomena of matter—how substances change as solid, liquid and gas and how they behave near absolute zero, where, once started, an electric current may never stop and a stirred cup of helium may turn for all time.

### Plot against the Jews

From 1946 to 1953, in the final phase of Stalin's era of terror culminating in the trumped-up charges of the "Jewish Doctors' Plot," Jews, perhaps more than any other group in the Soviet populace, were discriminated against, persecuted, arrested, exiled, and even shot. The highest placed among them were not spared by the Stalin-Beria se-

## Stalin needed Landau's brain. . . . So it came about that Landau had to help the Soviets make their first atomic bomb.

cret police. Landau, among others, had his uneasy moments. There was a report that for a time he was mysteriously imprisoned.

Yet, clearly, Stalin needed Landau's brain. In 1946, Landau was awarded the Stalin Prize for his work in the thermodynamic theory of phase transformation in solids. For Stalin, in all his madness, there was a more crucial reason for sparing and even rewarding Landau: In the immediate post-World War II period, Landau was known to the Kremlin not alone for his research in the theory of solids, low-temperature physics, and superconductivity—his chief importance to Stalin lay in Landau's work in nuclear physics and cosmic rays. And so it came about that Landau had to help the Soviets make their first atomic bomb.

### Top role in space

The more lenient post-Stalin days coincided with significant Soviet break-throughs in rocketry. Landau, too, played a top role in the Russian space efforts and triumphs. When in April, 1962, Khrushchev's government gave Landau the Lenin Prize, the official citation enumerated his 1941-60 series of books on theoretical physics: *Mechanics*, *The Theory of Fields*, *Quantum*

*Mechanics*, *Statistical Physics*, *Mechanics of Solids*, and *Electrodynamics of Solids*.

Landau's writings, translated into several languages, have also been published in the United States, England, Japan, China, Poland, and Yugoslavia. He has been honored by memberships in the foremost learned societies of America, Britain, Holland, and Denmark. He has won West Germany's Max Planck Medal (established in memory of the father of the quantum theory). And a number of Soviet medals, including two Orders of Lenin, have been pinned on his chest at various times.

On August 21, 1963, the Moscow *Komsomolskaya Pravda* revealed the existence of the so-called Landau's Minimum. This is a list of books dealing with theoretical physics compiled by Landau. Dubbed by Russian students "that terror-inspiring list," it is a "must" for the young Russians who want to become good physicists. But, said the newspaper, "the list is not mastered by nearly every university graduate in physics—so difficult is it."

Yet Landau's Minimum is more than a students' legend. It is a goal, a mark of crowning success, once a Russian student reads and understands all the weighty volumes on that list.

The fondest dream of any young Soviet physicist worth his ions is to study not only under Kapitsa or Tamm, but also under Landau. In the words of Academician Kapitsa himself:

"Landau's clarity of thought and precise style of work have helped him to bring up several generations of physicists. He is one of the few physicists to whom you may address a question on anything in his field at all—and receive a truly thorough answer. Landau's theoretical method has an important feature: he does not separate theory from experiment. This is what he teaches the young ones. And I can say confidently that there is not a single able physicist anywhere who does not know Landau's work, to whom Landau's books are not a kind of modern encyclopedia of physics."

### Admiring the abstract

Like his friend Kapitsa, Landau is keenly interested in all sorts of experimentation, some of which have nothing to do with the precise sciences. Thus Landau joined Kapitsa in admiring and encouraging the abstract sculpture of Ernst Neizvestny.


More than Kapitsa, Landau has branched out into philosophy. But he talks philosophy rather than writing and publishing it. A former Soviet engineer, whom I met in Munich last April, told me about private discussion meetings held in the middle 1950s in the Moscow homes of certain prominent Soviet

scientists, with Landau present and discoursing on deep and far-ranging philosophical problems with a select circle of close friends. The engineer happened to know of these get-togethers and debates, because some of the meetings were held in the house of an uncle of his, himself a highly regarded scholar.

In recent years, Lev Landau has also turned popular lecturer and writer for the masses. A great many copies of his recent (1963) book, *Physics for Everybody*, written in collaboration with Professor A. Kitaigorodsky, were printed by the State Publishing House of Physics-Mathematical Literature.

The Kremlin leadership is of course smug about Landau and his achievements as it makes a point of claiming as the Party's the merit for all the achievements of Russian science. The Communist leaders try even to have people equate science with the Party.

They have seldom allowed Landau to go abroad to garner his foreign scientific honors. Yet, at home, the Kremlin has had to concede to Landau as much independent thought and behavior as he himself elects to have. And it is because of such independence that this Nobel Prize winner has created for the world's science so much, so early in his life, and so well.



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[illegible]

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# Science in the news

Science is getting it in the neck. In the space of a few days:

The House Appropriations Committee killed a \$114 million program to intensify science education through the National Science Foundation, and it cut \$151 million from the amount the foundation wanted in extra funds for its current programs.

The full House OK'd the same committee's recommendation to cut \$250 million from the already reduced funds already authorized by Congress for NASA. Before the vote, Werner von Braun, head of NASA's Marshall Space Flight Center, said such action could be "a major national calamity" and would slow our schedule to put a man on the moon by 1970.

A special House committee got the \$500,000 IT needed to see where all the money for government-financed research is going.

The Center for the Study of Democratic Institutions published a series of papers flailing scientists for their limitations. Scott Buchanan, former dean of St. John's

## Science in the news

College, said scientists as a rule "are not able to take responsibility for their own strategic judgements in science, to say nothing of the uses to which their work will be put." Robert M. Hutchins, president of the Center, said scientists are educated to do nothing but collect facts and are so specialized they have "no general ideas."

NASA also made nonfinancial news. It:

1. Ordered a major reorganization to "strengthen the lines of authority and responsibility between headquarters and field installations" at, for instance, Cape Canaveral, Houston, and Huntsville, Ala....
2. Disclosed a shortage of engineering managers at its Manned Spacecraft Center ....
3. Criticized American industry for poor workmanship in the parts provided for Project Mercury--then said the criticism was made to appear sharper than was intended....
4. Dropped, at the Weather Bureau's request, the Nimbus weather satellite program, in favor of an advanced system of long-lived and successful Tiros weather spies.

The military took new steps in space. The Navy launched a satellite powered entirely by atomic energy--the first yet. A little larger than a basketball, the generator is called SNAP 9-A.... Two satellites were shot tens of thousands of miles into space to detect any nuclear blasts in space in violation of the recent test-ban treaty.

Is the moon race on or off? In voting funds for NASA, the House tacked on a condition that none of the money could be used for any U.S.-Soviet program in sending a man to the moon--a slap at President Kennedy's proposal before the UN. Then, in the upper chamber, Sen. J.W. Fulbright urged an end to the race and said funds cut from the space budget should be reallocated to education and employment undertakings. Meanwhile, Britain's Sir Bernard Lovell predicted that Russia would land instruments on the moon within months. Outlook: Americans are getting cooler about the moon project--with the cooperation of the Soviets or without.

There's growing concern about the hazard of fallout from underground nuclear testing. The Atomic Energy Commission admitted that "a few Utah infants" may have been exposed to excessive radiation from milk that was contaminated by radioactive iodine 131 from underground blasts at the Nevada test site. The test-ban treaty prohibits fallout outside national borders. It's expected that stricter precautions will now be taken.

East-West talks produced another pact --to ban the orbiting of space vehicles with nuclear weapons. The U.S.-U.K.-U.S.S.R. agreement won support from other nations in the UN. One hold-out: France. But there were hints of an eventual U.S.-French atom pact.

## Science in the news

Threats and promises made medical news. The Veterans Administration warned that a brown spider common in the Southeast can be fatally poisonous. It's called the *Loxosceles reclusus*. You can tell it by the dark spot shaped like a violin on its head.... The University of Pittsburgh's School of Medicine announced that a chemist has come up with a form of insulin that may be manufactured as cheaply as aspirin.

A monkey's kidneys were transplanted to a young woman in New Orleans. Physicians and surgeons made the transplant at Tulane University. The woman was reported comfortable. Her own kidneys were not removed, so they could take over again if the monkey's did not work. One report speculated that animal hearts may be used some day to boost people's ailing hearts.

In New Zealand, a baby's life was saved by a blood transfusion before birth. The baby had Rh blood which was incompatible with the mother's blood. How was the transfusion performed? U.S. doctors heard that the blood was injected into the placenta, which is attached to unborn babies by the umbilical cord, providing the embryos with nourishment and oxygen from the mother. The injection reportedly was made with a hypodermic needle inserted through the mother's abdomen. Dr. G.H.Green, of the Post Graduate School of Obstetrics and Gynecology in Auckland, would not predict future success.



Man unfolded another secret of the atom. At the International Atomic Research Center near Geneva, scientists observed what was believed to be the first of a new family of atomic particles. The particles are known as W (weak) particles or intermediate bosons. A recent report said all particles of matter had been discovered. The new ones are believed to be "outside" of matter, in a group of forces of which gravity and magnetism are members. The particles are called weak because they embody the action of a force from decaying radioactive material. The first of the new particles were detected by the bubbles left when protons struck a metal wall 82 feet thick in an atom smasher.

The Public Health Service said it does not expect any widespread outbreaks of flu this winter. So-called A2 and B viruses, responsible for epidemics the past two winters, won't recur widely for two years, it said.

QUOTE OF THE MONTH: "The society which creates scientists by diminishing the ranks of its philosophers may in the end have little need for either. It is the proper balance between the disciplines that is worth preserving, for substantial gaps in man's creative advance can well be detrimental to his progress." --CRAWFORD H. GREENEWALT, Board Chairman of the Du Pont Company.

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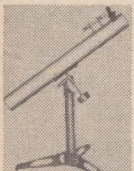
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## MINIATURE WATER PUMP

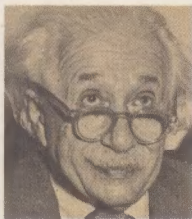


Wonderful for experiments, miniature waterfalls, fountains, HO gage railroad backdrops, etc. Tiny (2 5/8" 1 3/8")

and pump ideal for hobbyists, labs,

## In this issue . . .

Most scientists accept Einstein's theories. But, because the distances and speeds involved are so great, they have not been able to "prove" some of them. Now a group of scientists have worked out an ingenious experiment to test one of Einstein's basic concepts. Read about it on page 69.



This delightful young lady is waiting for mistletoe to work its magic. But mistletoe is good for a lot more than kisses, or so many people once thought. Page 61.



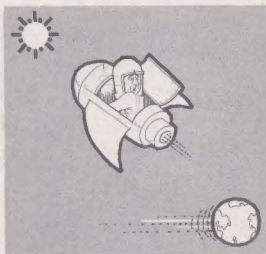
This fellow is a friend of Walt Disney's. He and a lot of Disney's other friends will be at the 1964 New York World's Fair. If you want to know what they'll be doing there, turn to page 8.



Primitive man knew a lot about caves. He had to—he lived in them. Although modern man no longer calls a cave home, almost everyone is fascinated by them. On page 5 you can test your knowledge of these holes beneath the ground.



In 1906, San Francisco was devastated by an earthquake. Scientists know that right now tension is building up beneath the earth and that another major earthquake is due. Page 27.



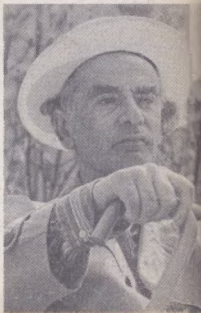
A major problem with space travel is that everything is going somewhere else, and a small error could add up to tens of thousands of miles. To know where you are and where you are going, see page 35.



Could all the dollars and talent now being used to send a man to the moon be put to better use right here on earth? For a strong statement on this timely subject, see page 43.



Combining the job of research doctor and the job of raising a family of four seems almost impossible, but Drs. Clara and Julian Ambrus make it look easy. For a close-up of their rewarding double life, see page 48.



Soviet physicist Lev Landau "came back from the dead" to win the Nobel prize. The dramatic story of his life and near death starts on page 83.